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HSL No. 75-1  
JANUARY 30, 1975

THIS ISSUE CONTAINS:

HS-015 158; 160; 163-275; 277-279

HS-801 160; 163; 174-176; 178; 184; 202; 211; 213;  
216-218; 224; 228-229; 239

U.S. Department of  
Transportation

National Highway  
Traffic Safety  
Administration



*SHELVES IN STACKS S.B.T.*

# Highway Safety Literature

...A MONTHLY ABSTRACT JOURNAL

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**Order by title and accession number: PB, AD, or HS.**

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**Corporate author:** Inquiries should be addressed to the organization listed in the individual citation.

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**See publication:** Articles in journals, papers in proceedings, or chapters in books are found in the publication cited. These publications may be in libraries or purchased from publishers or dealers.

**SAE:** Society of Automotive Engineers, Dept. HSL, 400 Commonwealth Drive, Warrendale, Pa. 15096.  
**Order by title and SAE report number.**

**TRB:** Transportation Research Board, National Academy of Sciences, 2101 Constitution Ave., N.W. Washington, D.C. 20418.

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*[Redacted area]*

**Due to circumstances beyond our control, there  
will be no indexes published in this issue of  
Highway Safety Literature .**

# **ALCOHOL COUNTERMEASURES AND THE VERMONT SYMPOSIUM. THE DRINKING DRIVER AND RESEARCH ACTIVITIES OF THE NATIONAL INSTITUTE ON ALCOHOL ABUSE AND ALCOHOLISM. FORUM DISCUSSION**

Vermont's approaches to the drinking driver problem are examined in terms of alcohol countermeasures in the state and research activities of the National Institute on Alcohol Abuse and Alcoholism (NIAAA). Specific reactions to a symposium program are outlined, and proposed axioms related to the development of countermeasure programs are described. These deal with social behavior and attitudes, penalties, public education, program evaluation, and funding. NIAAA divisions are cited which are involved in prevention of alcoholism and alcohol abuse, community and state programs for special treatment and rehabilitation programs, and research. Research grants in high-priority fields are noted, including those assessing the effects of alcohol on perceptual, cognitive, and motivational aspects of driver performance.

by R. B. Voas; A. A. Pawlowski  
National Hwy. Traf. Safety Administration, Washington, D. C.; National Inst. on Alcohol Abuse and Alcoholism, Rockville, Md.

Publ: HS-801 096, Alcohol, Drugs and Driving p273-96  
1974 ; 8refs

Availability: Bound in HS-801 096

## **HS-015 160 003RATINGS OF PRESENT KNOWLEDGE AND RELATIVE PRIORITIES FOR BASIC AND APPLIED RESEARCH.**

The 35 invited participants at the Vermont Symposium rated 176 keyword topics on three dimensions of alcohol, drug, and driving problems: the extent of present knowledge; relative priority for basic research in terms of informational yield; and relative priority for applied research in highway safety. Keywords having the highest priorities for basic alcohol and drug research were organized into three general categories of influences: upon basic neurophysiological activities (central and autonomic nervous systems); upon the psychological processes of perception (dynamic visual acuity and visual search), attention, and cognition such as risk taking and decision making; and in combination with other conditions of the driver, such as emotion, mood, and fatigue or noise stress. The highest priority ratings for applied research in highway safety were very similar to those for basic research, especially for alcohol and to a lesser extent for other drugs. None of the keywords concerning drug countermeasures received above average priority ratings, and it was concluded that more incidence and prevalence studies are necessary to define the nature and scope of the drug and highway safety problem before any countermeasure programs can be undertaken.

by M. W. Perrine; H. Moskowitz; H. Barry, 3rd.; M. S. Huntley, Jr.; P. M. Hurst; R. G. Smart; R. A. Lubin; G. J. Driessen; P. M. Zunder  
Publ: HS-801 096, Alcohol, Drugs and Driving p299-380  
1974 ; refs 011Sponsored by Univ. of Vermont, Psychology Dept., the Psychological Res. Foundation of Vermont, Inc., Burlington, and the National Hwy. Traf. Safety Administration. Includes the program for the Vermont Symposium on Alcohol, Drugs, and Driving, Warren, 12-15 Oct 1972.

Availability: Bound in HS-801 096

# **FATAL PEDESTRIAN COLLISIONS: DRIVER NEGLIGENCE**

Drivers involved in 180 fatal collisions with Baltimore pedestrians were studied, and 83 drivers (46%) were judged to have been probably negligent and 66 (37%) were probably not negligent. Negligence was not known for 31 (17%). Driver negligence was correlated with poor driving records. The study drivers had more points for traffic convictions than the average Maryland driver. Their driving records resembled those of drivers killed in crashes. Recommendations include quantitative tests for alcohol of all drivers who kill pedestrians and swifter suspension of licenses of those drivers believed to pose a substantial hazard to society. Ultimate solutions may lie in modifying roads, vehicles, and traffic patterns in order to reduce pedestrian injuries and deaths.

by S. P. Baker; L. S. Robertson; B. O'Neill  
Publ: American Journal of Public Health v64 n4 p318-25 (Apr 1974)

1974 ; 27refs

Prepared in cooperation with the Maryland Motor Vehicle Administration and the Baltimore City Police Dept. Sponsored by the Insurance Inst. for Hwy, Safety and the Maryland Medical-Legal Foundation.

Availability: See publication

## **EVALUATION OF ADAPTIVE AUTOMOTIVE DRIVING AIDS FOR THE DISABLED**

A testing and evaluation program for adaptive automotive driving aids for the disabled is described. The program involved six steps: survey of existing state and federal regulations applicable to adaptive controls and to the licensing of handicapped drivers; survey of manufacturers of adaptive controls; initial examination of each system by the Laboratory Test Jig; laboratory testing by means of a computerized driver-training simulator; installation in an automobile and field testing by handicapped drivers; and tests of fatigue-life cycle to determine the effective safe life of each control system. It is concluded that minimum safety standards for adaptive automotive controls are needed to protect handicapped drivers and the general public.

by C. C. Freeman  
Publ: Bulletin of the New York Academy of Medicine v50 n4 p536-44 (Apr 1974)

1974

Presented at a meeting of the Section on Biomedical Engineering of the New York Academy of Medicine, 9 Oct 1973.

## **EFFECT OF DRUGS AND ALCOHOL ON psychomotor SKILLS RELATED TO DRIVING**

Driving is characterized as a psychomotor task which requires senses, motor skills, attention, and memory; and factors which influence informational processing, including drugs and alcohol, are discussed. The effects of alcohol considered include vision and hearing, information processing capacity, fatigue, and risk taking. Drugs examined in the literature and laboratory tests reported include: cannabis, neuroleptics, antianxiety

agents, muscle relaxants, hypnotics, anaesthetics, antihistamines, anticholinergics, analgetics, stimulants, antiepileptics, antiparkinson drugs, insulin, oral antidiabetics, beta-adrenergic blocking agents, and the combined effect of drugs and alcohol. It is concluded that the main limitation to driving is the impairment of the human information processing capacity.

by M. Linnoila  
 Publ: Annals of Clinical Research v6 p7-18 (1974)  
 1974 ; 126refs  
 Availability: See publication

HS-015 166

### **MAKING BETTER USE OF EXISTING FACILITIES THROUGH HIGHWAY SAFETY IMPROVEMENTS. MANPOWER ALLOCATION AND COUNTERMEASURE EVALUATION**

The improved utilization of existing transportation facilities is examined with regard to traffic law enforcement agencies confronted with increasing demands for service with insufficient manpower and budgets. The Arizona Highway Patrol project using emphasis patrols concentrated attention on the factors shown to be predominant in accidents on a specific high fatality-rate roadway. Modifications in manpower assignment and countermeasure techniques reduced significantly fatalities as well as injuries and property damage. Other state and national projects followed. Project, Interstate Model Patrol and Accident Control Technique (IMPACT), which makes use of innovative patrolling methods, ticket issuance, police-driver psychology, and drinking driver arrests was begun in January 1973 and is still underway. Contingency planning is also considered.

by G. L. Goodson  
 Arizona Dept. of Public Safety, Phoenix  
 1974 ; 11p 7refs  
 Presented at the Transp. Res. Board Meeting, Jacksonville, Fla., 5-7 Aug 1974.  
 Availability: Corporate author

HS-015 167

### **THE JACKSONVILLE EMERGENCY MEDICAL SYSTEM. A MODEL FOR THE SEVENTIES. REV. ED.**

The Emergency Medical System of Jacksonville, Florida, entails a takeover by the fire department of all emergency ambulance service. Calls from the scene come into the Emergency Operation Center from either home phone or special emergency phones mounted on street corners, and the center has direct lines and radio communications with all hospital emergency departments in the city, and with the switchboard of the county medical society. Ambulance and medical personnel response to an emergency is described, along with training, equipment, and Supervision. The reduction of the automobile death rate is noted, with a save rate on injured victims of 99%. The practice of on-scene diagnosis and advanced treatment, as opposed to first aid, is emphasized as being a significant factor. Use of the system for cardiac patients is detailed.

by J. M. Waters  
 Jacksonville Office of the Director of Public Safety, Fla.  
 1973 ; 12p  
 Availability: Corporate author

HS-015 168

### **MAKING BETTER USE OF EXISTING FACILITIES THROUGH HIGHWAY SAFETY IMPROVEMENTS**

Management issues and findings related to highway safety improvements by highway agencies are reported. It is concluded that achieving greater utility from highway safety improvements will depend on: more consistently by applying the improvements to the right problems; installing increased numbers of improvements proven by evaluation to be effective; and altering the highway safety improvement program to broader goals and reflect evaluation findings. Suggestions made for management to commit the organization to solve the problem of unsafe conditions on the highway system: systematic evaluation; organize personnel, procedures, organizational units to implement the system; schedule system implementation; and coordinate the development and operation of the system to ensure cooperation from involved organization units.

by R. E. Jorgensen  
 Jorgensen (Roy) Associates, Inc., Gaithersburg, Md.  
 1974 ; 10p  
 Presented at the Transp. Res. Board Meeting, Jacksonville, Fla., 5-7 Aug 1974.  
 Availability: Reference copy only

HS-015 169

### **DO PROBLEM PEOPLE DRIVE PROBLEM CARS**

The relationship between driver habits and personality and maintenance of his car was examined in an intensive investigation of 34 randomly selected automobile crashes involving vehicles two or more years old in Houston, Texas. The reviewed psychological, personality, social, and health factors in a complete autopsy and toxicological study in case of each crash and a detailed study of the 34 vehicles by engineers and automotive specialists with particular focus on vehicle subsystems defects or maladjustments. Of the 34 driver died, 22 were judged to have significant psychopathology; the 12 rated normal, only one was driving a vehicle with subsystems defect judged to be causative in the crash; 22 rated abnormal, 10 were driving vehicles with causal subsystems defects. The conclusion was that abnormal personality functioning contributes to auto crashes in two ways: by risk-taking driver behavior and by defective vehicle maintenance.

by A. D. Pokorny; J. P. Smith; J. R. Finch  
 Publ: Traffic Safety v72 n9 p16-7, 37-9 (Sep 1972)  
 1972  
 Availability: See publication

HS-015 170

### **ELASTOPLASTIC ANALYSIS OF AN AUTOMOBILE BODY STRUCTURE**

An analytical model and a method of analysis are presented to predict the elastoplastic response of an automobile passenger compartment. The model is constructed as a two-dimensional frame structure with flexible joints. The material nonlinearity is assumed to be concentrated at the joints, and the non-joint characteristics are obtained from tests. An incremental stepwise linear analysis procedure is developed to perform

January 30, 1975

elastoplastic analysis. Excellent correlations between analysis and test results are obtained.

by D. C. Chang; Y. -R. Kan  
General Motors Research Labs., Warren, Mich.  
Rept. No. GMR-1634 ; 1974 ; 12p 12refs  
Prepared for presentation at the International Conference on  
Computational Methods in Nonlinear Mechanics, Austin, Tex.,  
23-25 Sep 1974.  
Availability: Corporate author

HS-015 171

### **THE AUTOMOBILE--ENERGY AND THE ENVIRONMENT. A TECHNOLOGY ASSESSMENT OF ADVANCED AUTOMOTIVE PROPULSION SYSTEMS**

The secondary impacts of a transition to advanced automotive propulsion systems are examined in a technology assessment. The results of the program relate impacts in multiple areas to the choice of government policy options available, including government subsidy, taxation, and regulation. Impact areas are materials, energy, environment, economics, and societal. A transition model is described which features a year-by-year characterization of the fuels and energy changes brought about by introduction of a new engine type. The changes are related to the current passenger vehicle baseline as well as to changes in the predicted trends for overall U.S. energy utilization. An objective is to identify and detail alternative low-polluting vehicles that present significantly differing potential impacts on American life and that might be mass produced by 1985.

by D. G. Harvey; W. R. Menchen  
Hittman Associates, Inc., Columbia, Md.  
CONTRACT NSF-C674  
1974 ; 175p 29refs  
Sponsored by the RANN Program of the National Science Foundation.  
Availability: National Science Foundation, Washington, D.C.  
20550

HS-015 172

### **MOTOR CARRIER SAFETY REGULATIONS**

Motor carrier safety regulations of DOT are presented. They deal with: parts and accessories; hours of service of drivers; inspection and maintenance; driver qualifications; written examinations; notification, reporting, and recording of accidents; transportation of hazardous materials; driving and parking rules.

Bureau of Motor Carrier Safety, Washington, D.C.  
1974 ; 133p refs  
Includes amendments as of 14 Jun 1974.  
Availability: GPO \$1.20

HS-015 173

### **THE CHILD IN DETROIT TRAFFIC**

Major causes of child traffic injury and fatal accidents in Detroit are examined. Topics covered include: actions of child pedestrians and bike and minibike riders injured or killed in traffic; time of day and day of week of child accidents; location of accident; accidents by age group and by precinct; analysis of accidents occurring while child was going to or from

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school; school attending (public or parochial). Results are presented in tabular form.

Detroit, Police Dept., Mich. Traffic Safety Unit  
1973 ; 18p  
Availability: Corporate author

HS-015 174

### **THE MEASURED INFLUENCE OF FLOW DISTRIBUTION ON REGENERATOR PERFORMANCE**

The significant influence of the distribution of flow in a gas turbine rotary regenerator on its performance is described. The results of an experimental study, conducted in a full-scale regenerator test facility, demonstrate the effects of measured flow maldistributions on regenerator performance. Test facility plenum modifications on the gas side and a change in the regenerator cover contour on the air side are shown to result in an increase in effectiveness and an improvement in pressure drop characteristics. Comparisons are made between effectiveness data and estimates obtained using an analytical model.

by J. A. Kutchev; H. L. Julien  
General Motors Research Labs., Warren, Mich.  
Rept. No. SAE-740164 ; 1974 ; 11p 4refs  
Presented at the Automotive Engineering Congress, Detroit, 23 Feb - 1 Mar 1974.  
Availability: SAE

HS-015 175

### **LYCOMING'S LTS 101 ENGINE DESIGN**

The LTS 101 engine, the product of an extensive design and development program, is shown to have resulted in a powerplant in the 600 shp class. The low-cost features contributing to this competitive class are given. Although primarily designed and considered for helicopter applications, the LTS 101's primary objective was for a low-cost industrial engine that would also comply with aircraft standards. Through the integration of low-cost design concepts, a core engine design which offers remarkable installation flexibility has been created.

by J. Moore; E. Pease  
AVCO Lycoming Div., Stratford, Conn.  
Rept. No. SAE-740165 ; 1974 ; 9p 2refs  
Presented at the Automotive Engineering Congress, Detroit, 23 Feb-1 Mar 1974.  
Availability: SAE

HS-015 176

### **VARIABLE COMPRESSOR GEOMETRY IN THE SINGLE-SHAFT AUTOMOTIVE TURBINE ENGINE.**

the single-shaft gas turbine engine is proposed as a reduced cost alternate to the previously used two-shaft turbine engine for application to passenger cars. The power output characteristics of the fixed-geometry single-shaft engine are found to create performance difficulties with respect to standing-start acceleration of the vehicle. A review of the fundamentals responsible for these difficulties leads to the observation that variable compressor geometry can provide relief from this situation. Use of variable inlet guide vanes is identified as the

simplest means of gaining this relief. Design factors influencing the susceptibility of the compressor to control by inlet guide vanes are considered. A method by which inlet guide vanes can be used to improve vehicle acceleration without penalizing fuel consumption is illustrated.

by D. C. Sheridan; G. E. Nordenson; C. A. Amann  
General Motors Res. Labs., Warren, Mich.  
Rept. No. SAE-740166 ; 1974 ; 14p 16refs  
Presented at the Automotive Engineering Congress, Detroit, 25 Feb-1 Mar 1974.  
Availability: SAE

HS-015 177

### DESIGN OF HIGH HEAT RELEASE SLINGER COMBUSTOR WITH RAPID ACCELERATION REQUIREMENT

The design and development of a high heat release slinger combustor for drone and missile applications is described. It can deliver in excess of 12 X 10 to the sixth power Btu/h-cubic ft-atm (1.22 kW/cubic m Pa). Pyrotechnic devices are used for ignition and acceleration. Optimized fuel scheduling combined with efficient combustor and fuel slinger characteristics have demonstrated engine start and acceleration to maximum power in less than 5 s at sea-level conditions.

by C. Rogo; R. L. Trauth  
Teledyne CAE, Toledo, Ohio  
Rept. No. SAE-740167 ; 1974 ; 17p 10refs  
Presented at the Automotive Engineering Congress, Detroit, 25 Feb-1 Mar 1974. Sponsored by the Naval Air Systems Command.  
Availability: SAE

HS-015 178

### USING HYDROGEN FUEL CELLS FOR URBAN TRANSPORTATION

The installation of a hydrogen-air cell in a Renault 4L-type vehicle is detailed. The weight of the power source is acceptable, as are the rates of acceleration. A speed of 80 km/h (50 mph) can be sustained continuously, and an autonomy of between 230 and 560 km (143 and 348 miles) can be attained, depending upon the speed of the vehicle, with an effective load of 340 kg (750 lb). Two important obstacles (power source and use of hydrogen) are in the process of being solved by using inexpensive materials and by storing hydrogen by means of hydrides. The hydrogen-air fuel cell is shown to be a decisive contribution to the use of electric vehicles, and its influence could become even greater if, on a long-term basis, the trend to make intensive use of hydrogen as an energy extension is confirmed.

by Y. Breelle  
Institut Francais du Petrole, Paris  
Rept. No. SAE-740168 ; 1974 ; 13p 13refs  
presented at the Automotive Engineering Congress, Detroit, 25 Feb-1 Mar 1974.  
Availability: SAE

HS-015 179

### THE DESIGN OF D-C COMMUTATOR MOTORS FOR HIGH PERFORMANCE ELECTRIC VEHICLES

The design of d-c commutator motors for high performance drivers in electric vehicles is examined, and details are given of the power/speed characteristics which the motor must provide, and of the influence on the design of quantities such as motor speed, efficiency, winding details and weight. An outline is given of a computer program which optimizes the motor design for electric vehicle duty, and an example is given of a 40 kW traction motor which powers an electric delivery vehicle.

by M. A. Thompson; L. A. Walters  
Lucas (Joseph) Ltd., Shirley, Warwick (England)  
Rept. No. SAE-740169 ; 1974 ; 9p  
Presented at the Automotive Engineering Congress, Detroit, 25 Feb-1 Mar 1974.  
Availability: SAE

HS-015 180

### ELECTROBUS--REVIEW OF 9000 MILES OF CITY TRANSIT DEMONSTRATIONS

A simple, battery-operated, long life, low maintenance, city transit electric bus developed with low pollution and low noise emission features is described. The Electrobus, designed to accommodate 21-31 seated passengers, has been test driven in demonstration service more than 9000 miles in several large cities in the U. S. and Canada. Performance and power measurements have been taken from demonstrations at several typical urban center city bus service operations. From test results detailed, it is shown that the electric bus obtains 11.5 miles/gal of fuel compared to 3.5 and 6.0 miles/gal for equivalent sized gasoline and diesel engine buses in similar urban transit service.

by B. Borisoff  
Electrobus, Studio City, Calif.  
Rept. No. SAE-740170 ; 1974 ; 11p 3refs  
Presented at the Automotive Engineering Congress, Detroit, 25 Feb-1 Mar 1974.  
Availability: SAE

HS-015 181

### CONSERVATION OF PETROLEUM RESOURCES BY THE USE OF ELECTRIC CARS

In an examination of petroleum resource conservation, the thermal content of a typical grade of crude petroleum is used as the input energy and road load is used as the output energy. Efficiencies in refining, transportation, storage, and conversion to mechanical energy are considered, assuming in all cases the performance expected of equipment installed in the late 1970's. The conclusion is reached that electric propulsion is significantly more efficient than gasoline engine propulsion and can reduce the road vehicle consumption of petroleum by 32%. This amounts to a 13% reduction of all petroleum used.

by N. Mapham  
Energy Devel. Associates, Madison Heights, Mich.  
Rept. No. SAE-740171 ; 1974 ; 4p 4refs  
Presented at the Automotive Engineering Congress, Detroit, 25 Feb-1 Mar 1974.  
Availability: SAE

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### **DEVELOPMENT OF A FORMABLE LOW CARBON COLUMBIUM BEARING HIGH STRENGTH HOT ROLLED SHEET STEEL**

The approach used by automotive and line pipe steel producers to develop a higher strength sheet steel with improved formability, toughness, and welding characteristics is described. The appropriate stages of steel-making and hot rolling leading to the development of a columbium-bearing steel with a minimum yield strength of 50 ksi are also discussed. Typical mechanical properties and forming capabilities are presented, together with a discussion of the strengthening mechanisms and ductility factors utilized to achieve the 50 ksi product.

by W. E. Heitmann; R. R. Hilsen; P. L. Manganon; T. E. Moss  
Inland Steel Co., Chicago, Ill.  
Rept. No. SAE-740174 ; 1974 ; 14p 13refs  
Presented at the Automotive Engineering Congress, Detroit, 25 Feb-1 Mar 1974.  
Availability: SAE

HS-015 183

### **STRAIN RATE EFFECTS ON THE PROPERTIES OF HIGH STRENGTH, LOW ALLOY STEELS**

Experimental work done to define the response of several hot worked metals to several deformation rates is discussed. The results show that ferrous materials with low alloy contents are very strain rate sensitive under the conditions of testing, regardless of the static strength level. These materials exhibit strength and absorbed-energy increases and uniform elongation losses with strain rate increases. A 6061-T6 aluminum alloy tested for comparison showed no strain rate sensitivity over the range of testing conditions. In a practical sense, ferrous alloys will be stronger at high loading rates than expected from ordinary mechanical property measurements. This can be an important advantage when considering dent and crash resistance.

by D. A. Chatfield; R. R. Rote  
National Steel Corp., Pittsburgh, Pa.  
Rept. No. SAE-740177 ; 1974 ; 12p 10refs  
Presented at the Automotive Engineering Congress, Detroit, 25 Feb-1 Mar 1974.  
Availability: SAE

HS-015 184

### **APPLICATION OF HIGH STRENGTH STEELS TO WHEEL MANUFACTURING**

One approach to problems associated with higher strength materials for wheel fabrication is described. Automotive wheel spiders were press formed and fatigue tested, using various grades of high strength low alloy (HSLA) steels. Press performance of noninclusion shaped steels was poor, but that of inclusion shaped grades was good. Fatigue properties ranged

from slightly higher to three times higher than SAE 1012 commercial quality mechanical capped steel.

by J. A. Lumm; G. M. Hughes; B. J. Bastian  
Kelsey-Hayes CO., Romulus, Mich.  
Rept. No. SAE-740179 ; 1974 ; 11p  
Presented at the Automotive Engineering Congress, Detroit, 25 Feb-1 Mar 1974.  
Availability: SAE

HS-015 185

### **THE FORMING OF VANADIUM BEARING HSLA STEELS INTO AUTOMOTIVE COMPONENTS**

The newest grades of hot rolled, high-strength low-alloy (HSLA) steels, characterized by an ultrafine grain size, exhibit an excellent combination of strength (50,000-80,000 psi yield strength) and ductility. Various formability tests demonstrate that these steels are highly formable in spite of their high strength. Compared to mild steels, plane strain and stretch deformation characteristics of HSLA steels are reduced only by 25-40%. In the drawing mode deformation, HSLA steels perform similarly to mild hot rolled steels. HSLA steels have been formed into various components on dies originally designed for mild steels, indicating that with somewhat more generous contours the steels can be used effectively for mass production. Current failure limit diagrams are inaccurate for grid analysis of hot rolled steel parts: new ones are needed to reflect strain gradients in the thickness direction.

by B. N. Ferry; E. J. Paliwoda  
Jones and Laughlin Steel Corp., Pittsburgh, Pa.  
Rept. No. SAE-740180 ; 1974 ; 8p 14refs  
Presented at the Automotive Engineering Congress, Detroit, 25 Feb-1 Mar 1974.  
Availability: SAE

HS-015 186

### **DESIGN AND TEST LIMITATION ON REDUCING NITROGEN OXIDES IN GAS TURBINE COMBUSTORS.**

The limitations, as imposed by practical combustor and fuel systems designs, on the potential reduction of nitrogen oxide emissions are examined, based on flame temperature and residence time predictions. A premix combustor designed to operate at an equivalence ratio of 0.75 was tested with an ideally mixed gaseous fuel. This produced data demonstrating the lower limits of nitrogen oxides that might be attained and is compared to analytical model predictions. Burner designs incorporating lean equivalence ratios, premixing, and rapid mixing concepts were also tested. The results of the program indicate that the effects of nonuniform partially vaporized fuel-air mixtures as well as restrictive mixing rates attainable in practical combustors severely limit the full attainment of theoretical nitrogen oxide reductions.

by R. A. Breton; T. R. Koblish; R. L. Marshall  
United Aircraft Corp., East Hartford, Conn. Pratt and Whitney Aircraft Div.  
Rept. No. SAE-740182 ; 1974 ; 12p 9refs  
Presented at the Automotive Engineering Congress, Detroit, 25 Feb-1 Mar 1974.  
Availability: SAE

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### **THE INFLUENCE OF FLOW PATH GEOMETRY AND MANUFACTURING TOLERANCES ON GAS TURBINE REGENERATOR EFFICIENCY**

Cold airflow tests were carried out on a model gas turbine to find optimum flow path geometry and data to calculate the drop in heat exchanger efficiency. The entire test was conducted under true Newton number conditions. The efficiency calculation of the heat exchanger based on test results shows that the efficiency drop can be several percent. Suggestions are made as to the shape of the regenerator cover and power turbine diffuser.

by M. Kohler  
Volkswagenwerk A.G., Wolfsburg (West Germany)  
Rept. No. SAE-740183 ; 1974 ; 9p 2refs  
Presented at the Automotive Engineering Congress, Detroit, 25 Feb-1 Mar 1974.  
Availability: SAE

HS-015 188

### **CHEMICAL VAPOR DEPOSITED SILICON CARBIDE TURBINE ROTORS**

Chemical vapor deposited (CVD) silicon carbide (SiC) is shown to be one of the most promising materials, considering strength, creep, oxidation, fabricability, and cost, for a ceramic gas turbine rotor. The CVD process has produced rotors in the desired configuration and test samples with strengths of 100 ksi at 1400 deg C and peak values of 200 ksi at 1500 deg C. CVD SiC is a pure material with very low creep rates showing potential for operation to 10,000 h and possibly beyond at 1600 degrees C and 30 ksi compared to 1000 h at 1200 degrees C and 10 ksi for the best silicon nitride available. Under equal heat flux conditions, the thermal stress generated in CVD SiC is similar to the silicon nitride, and CVD SiC has superior oxidation resistance to other materials tested.

by R. E. Engdahl  
Deposits and Composites, Inc., Reston, Va.  
Rept. No. SAE-740184 ; 1974 ; 10p 11refs  
Presented at the Automotive Engineering Congress, Detroit, 25 Feb-1 Mar 1974.  
Availability: SAE

HS-015 189

### **LOW-COST TURBINE WHEEL MANUFACTURING PROCESSES**

Various process approaches used in manufacturing the LTS 101 gas turbine wheels are described which minimize labor input and material costs while maintaining standards of reliability and performance. The component configuration combines reliability, performance, and cost effectiveness. Turbine wheels designed as integral castings are suited to the investment casting technique; both gas producer and power turbine wheels in the LTS 101 are integral castings. An advanced Avco Lycoming developed superalloy was selected for both wheels to take advantage of the superior mechanical proper-

ties. Disc contour cutting, dampening hole drilling, and inertia welding are discussed.

by V. Strautman  
AVCO Lycoming Div., Stratford, Conn.  
Rept. No. SAE-740185 ; 1974 ; 8p 2refs  
Presented at the Automotive Engineering Congress, Detroit, 25 Feb-1 Mar 1974.  
Availability: SAE

HS-015 190

### **INTERNATIONAL CONGRESS ON AUTOMOTIVE SAFETY. (3RD) PROCEEDINGS, JULY 15-17, 1974, SAN FRANCISCO, CALIFORNIA, VOL. 1**

Vehicle size is discussed in terms of future vehicle mix and automotive safety. Vehicle factors affecting pedestrian and bicyclist safety are stressed. Papers are presented on: patterns of pedestrian and bicyclist injuries; safety compatibility of different size vehicles; distributions of accident losses for bicycles and different size vehicles; and the vehicle-pedestrian-bicyclist mix. Specific topics deal with injury models, motor-cycle accidents, tissue damage prediction, crash survivability, compact cars, seat belt effectiveness, school children accidents, urban accidents, and Australian and Tokyo statistics.

National Motor Vehicle Safety Advisory Council, Washington, D. C.  
1974 ; 540p refs  
Includes HS-015 191--HS-015 206.  
Availability: GPO \$5.00, Stock no. 5003-00172

HS-015 191

### **RELATIONSHIPS BETWEEN CAR SIZE, CAR WEIGHT, AND CRASH INJURIES IN CAR-TO-CAR CRASHES**

Some elementary theoretical relationships between car size, car weight, and severity of occupant crash injuries in car-to-car crashes are explored and developed using reasonable, simplifying approximations. Real-world crash data are used to demonstrate some of the effects of these relationships. Results suggest that there are penalties (in terms of increased occurrence of occupant injuries associated with differences in vehicle mass) to the occupants of the lighter car and that the penalties are generally greater than the the benefits to the occupants of the heavier car. For vehicles using the same roads, these relationships suggest a crashworthiness design concept for intervehicular crashes that regards increases in vehicle size as primarily protective, and increases in vehicle weight as primarily hostile, indicating the desirability of relatively sizeable but not heavy vehicles.

by B. O'Neill; H. Jokschi; W. Haddon, Jr.  
Insurance Inst. for Highway Safety, Washington, D. C.;  
Center for the Environment and Man, Inc., Hartford, Conn.  
Publ: HS-015 190, International Congress on Automotive Safety (3rd) Proceedings, Washington, D. C., 1974 P2-1--2-27 1974 ; 15refs  
Availability: Bound in HS-015 190

HS-015 192

**PEDESTRIAN INJURY MODEL**

A pedestrian Injury Model is described which identifies major injury causation factors in pedestrian accidents. A computerized mathematical/statistical model capable of predicting overall pedestrian injury and its severity was developed, predicted on the assumption that a sufficient data base was available to support the model. Several injury-causing variables are identified, notably: vehicle speed, vehicle mass, pedestrian mass, vehicle height (from ground level to point of impact on pedestrian), pedestrian height and the vehicle-pedestrian attitude. These variables in turn define three quantities that were found to be important in injury prediction: the net kinetic energy at impact; the ratio of vehicle height to pedestrian height; and the vehicle/pedestrian attitude. It is concluded that some means of energy absorbing mechanisms must be incorporated in vehicle design to reduce injury.

by A. M. Mayyasi; U. Pooch; P. E. Pulley; A. E. Harvey  
Texas A and M Univ., College Station  
CONTRACT DOT-HS-065-1-217  
Publ: HS-015 190, International Congress on Automotive Safety (3rd) Proceedings, Washington, D. C., 1974 p3-1--3-30 1974 ; 5refs  
Availability: Bound in HS-015 190

HS-015 193

**MOTORCYCLE COLLISION INJURIES**

Motorcycle injuries in Sacramento County, California during 1970 are described and certain factors associated with their occurrence are examined. Specific findings concerning the nature and severity of trauma associated with collisions are emphasized. The studies indicate that about one in every 28 registered motorcycles was involved in an injury-producing collision in 1970. Excluding abrasions, lacerations, and contusions, injuries to the musculoskeletal system in the form of fractures contribute the single largest cause of significant injury to victims. Over 29% of the 1273 persons injured sustained one or more fractures. Some 551 fractures were recorded with 20% of the injured sustaining two fractures and 12.4% sustaining three or more. Intracranial injuries represented the second most common injury, and the most serious single cause of death.

by R. S. Riggins; J. F. Krauss; C. E. Franti; W. F. Drysdale  
California Univ., Davis. School of Medicine  
Publ: HS-015 190, International Congress on Automotive Safety (3rd) Proceedings, Washington, D. C., 1974 p4-1--4-22 1974 ; 10refs  
Availability: Bound in HS-015 190

HS-015 194

**SOME FACTORS ASSOCIATED WITH SEVERITY OF INJURIES IN MOTORCYCLE COLLISIONS.**

Human, vehicle, and environmental factors associated with the level of injury sustained in motorcycle collisions are described. Details are given on; age, sex and driver/passenger status; helmet use; speed of motorcycle at impact; month, day and hour of occurrence; type of collision; type of road; speed and combined driver-vehicle weight; speed and type of collision and road of occurrence; and motorcyclist restraint systems. It is shown that factors associated with the incidence of collisions

are not identical to those involved with the severity of the injury sustained. Age of the driver, use of helmets, type of collision, and speed at time of the crash are seen to be related to the severity of the injury involved. Other factors may also be related to severity and should be an area of future research in injury prevention.

by J. F. Kraus; R. S. Riggins; C. E. Franti  
California Univ., Davis. School of Medicine  
Publ: HS-015 190, International Congress on Automotive Safety (3rd) Proceedings, Washington, D. C. 1974 p5-1--5-25 1974 ; 28refs  
Availability: Bound in HS-015 190

HS-015 195

**AN INDEX FOR PREDICTING TISSUE DAMAGE DUE TO IMPACT**

A methodology is identified and developed from the scientific and engineering principles that govern the behavior of a physical system for determining an index for predicting tissue damage due to impact. The principles include: the conservation laws, the laws of thermodynamics, and the constitutive relationships for the materials comprising the system. The kinematic variables chosen as inputs for the injury threshold model are readily available from the numerical simulations and experimental studies, including: linear accelerations, angular accelerations, masses of the body segments, moments of inertia of the body segments, and contact forces. The methodology is: utilizing the kinematic data, in combination with the mass and moment of inertia of the appropriate limb or body segment, the equivalent force acting on the system is calculated; the average stress acting on the tissue is calculated; and these parameters are then used to calculate the strain energy density associated with the state of the tissue system. The analytical expression relates the kinematic variables that describe a collision between a vehicle and a pedestrian to the level of injury that the pedestrian sustains. The injury severity index provides an unambiguous and consistent means of assessing the effects of multiple injuries.

by T. A. Krouskop; P. H. Newell, Jr.; A. E. Swarts; W. A. Hyman; L. A. Leavitt  
Texas A and M Univ., College Station  
CONTRACT DOT-HS-065-1-217  
Publ: HS-015 190, International Congress on Automotive Safety (3rd) Proceedings, Washington, D. C., 1974 p6-1--6-18 1974 ; 12refs  
Availability: Bound in HS-015 190

HS-015 196

**PEDESTRIAN CRASH TRAUMA AND VEHICLE DESIGN IN NEW SOUTH WALES, AUSTRALIA**

Pedestrian crashes are related to the overall traffic crash situation in New South Wales, Australia, and the findings of two separate studies concerned with vehicles during the crash phase of pedestrian-involved traffic crashes are detailed. The data presented can be used to list the factors influencing the severity of trauma resulting from the crash phase and to draw inferences about modifications to the system, especially the vehicle design. Significant factors include pedestrian age, vehicle micro and macro structure of the front, and collision impact location and vehicle speed. It is concluded that, although a simple occupant restraint device has markedly reduced the trauma to occupants of vehicles involved in crashes, the data

HS-015 197

suggest that no similarly large decrease in pedestrian trauma is likely to result from a single simple change in vehicle design.

by R. R. Hall; R. G. Vaughan; A. J. Fisher  
New South Wales Univ., Sydney (Australia). School of  
Transp. and Traf.; New South Wales Dept. of Motor  
Transport, Sydney (Australia)  
Publ: HS-015 190, International Congress on Automotive  
Safety (3rd) Proceedings, Washington, D. C., 1974 p7-1-7-38  
1974 ; 16refs  
Availability: Bound in HS-015 190

HS-015 197

### COMPATIBILITY BETWEEN DIFFERENT-SIZED VEHICLES ON CRASH SURVIVABILITY

Collisions between vehicles of different weights are discussed, along with improvements to the mutual safety of both vehicles. It is shown that: the small car is at a disadvantage with regard to safety in a collision with the large car; the small car has greater economic merit, with its societal cost being about 75% of that of the large car; crashworthiness should be improved; for the possibility of balancing the crush strokes of both vehicles in car-to-car collisions at various speeds, the force-stroke characteristic of the front end should be reduced to the shape of a triangular wave, making each vehicle have a crush stroke reach its limit at nearly equal speed; large vehicles should have the front-end force set low, in order to cause less damage to the other party in a frontal collision with a smaller vehicle or in a side or rear-end collision with any vehicle, and to suffer less damage in low-speed collision with any object; in car-to-car collisions, the vehicle deceleration is in inverse proportion to the vehicle weight, but occupant safety can be increased by improving the body construction and occupant restraint systems of both large and small cars.

by N. Marumo; N. Aya; K. Takahashi; H. Nousho  
Nissan Motor Co. Ltd., Yokohama (Japan)  
Publ: HS-015 190, International Congress on Automotive  
Safety (3rd) Proceedings, Washington, D. C., 1974 p8-1-8-40  
1974 ; 4refs  
Availability: Bound in HS-015 190

HS-015 198

### AN ATTEMPT TO DEFINE AND TO QUANTIFY CAR-TO-CAR COMPATIBILITY

A clear physically interpreted definition of vehicle compatibility is developed, along with an attempt to quantify at least one objective quantity as some kind of compatibility index, and a guideline for how to determine the index value with minimum experimental effort. The compatibility of a vehicle 2 to the smallest reference vehicle 1 is defined by a speed ratio whose variables are the relative closure speed tolerable for a vehicle 1- vehicle 2 collision, the actual subject vehicle 2, and a fully rigid vehicle 2 proposed as a basis for comparison. The speed ratio is used to calculate a compatibility index (CI), and is related to the ratio of the energies dissipated in the two colliding vehicles. The CI is determined from the force-deflection

HSL 75-1

characteristic of the vehicle to be evaluated, assuming that this characteristic is recorded during a standardized reference test.

by W. Reidelbach; W. Schmid  
Daimler-Benz A.G., Stuttgart (West Germany)  
Publ: HS-015 190, International Congress on Automotive  
Safety (3rd) Proceedings, Vol. 1, Washington, D. C., 1974 p9-  
1-9-29  
1974 ; 11refs  
Availability: Bound in HS-015 190

HS-015 199

### FRONTAL AND SIDE IMPACT CRASHWORTHINESS--COMPACT CARS

Frontal and side crashworthiness tests for 6-cylinder, automatic transmission 1973 AMC Hornet sedans are summarized. It is shown that the compact car modification program produced substantial improvements over baseline vehicle performance, accomplished by a faster rising crash pulse. Modifications included weight increase (104 lbs), bumper energy absorbing units, ripple panels replacing the fender inner panel, collapsing front sills, secondary high-strength bumper, rear sills, and crushable beam membrane door panel. Production problems related to bumper steel and structure welding to thinner sections and foam injection into hinge areas are cited.

by W. J. Wingenbach; K. W. Schang  
AMF, Inc., Goleta, Calif. Advanced Systems Lab.; American  
Motors Corp., Detroit, Mich.  
CONTRACT DOT-HS-257-2-461  
Publ: HS-015 190, International Congress on Automotive  
Safety (3rd) Proceedings. Vol. 1, Washington, D. C., 1974 p11-  
1-11-87 0071974

Availability: Bound in HS-015 190

HS-015 200

### A SAFETY-COMPARISON OF COMPACT AND FULL SIZE AUTOMOBILES

Large and small car crash performance is examined in terms of incidence of accident involvement and relative accident severity within a large volume data base. Problems and biases associated with each of the measurements of effectiveness are discussed. The Vehicle Safety Design Surveillance System data banks are described, including response variables produced by the retrieval system which form the basis for analysis. They are: severest injury in the study vehicle; driver injury by severity; severest injury in the accident; and severest injury to non-occupants (pedestrians, bicyclists). A 1972 analysis of accidents by specific vehicle makes is considered along with two-vehicle collision data from 1971 and 1972 banks. It is noted that the largest factors influencing vehicle safety performance in the data are vehicle weight and use of the safety belt.

by B. Y. Scott  
New York State Dept. of Motor Vehicles, Albany  
Publ: HS-015 190, International Congress on Automotive  
Safety (3rd) Proceedings. Vol. 1, Washington, D. C., 1974 p13-  
1-13-23  
1974  
Availability: Bound in HS-015 190

HS-015 201

**AN OVERVIEW OF THE BICYCLE ACCIDENT PROBLEM**

The nature and severity of bicycle accidents and the efficacy of possible countermeasures to reduce bicycle accident losses are examined. Statistics are given on contributing factors and bicyclist injuries. It is suggested that countermeasures directed at accident prevention have the greatest likelihood of success, including pre-crash programs aimed at the biker, his bicycle, and the riding environment. A bicycle riders safety code is presented, and recommended objectives of an intensive ongoing educational program are given. The most effective way to reduce modal conflicts is shown to be total grade separation. Crash phase considerations are directed to injury prevention through protective clothing, improved bicycle design, and bicycle paths. Postcrash phase measures are concerned with severity reduction by proper care for the injured and crash site cleanup.

by P. H. Wright  
Georgia Inst. of Tech., Atlanta. School of Civil Engineering  
Publ: HS-015 190, International Congress on Automotive Safety (3rd) Proceedings. Vol. 1, Washington, D. C., 1974 p17-1--17-25  
1974 ; 19refs  
Availability: Bound in HS-015 190

HS-015 202

**RELATIONSHIP BETWEEN VEHICLE FRONTAL GEOMETRY AND PEDESTRIAN ACCIDENT SEVERITY**

The relationship between frontal geometry including design features of automobiles and pedestrian accident severity is examined. The pedestrian population, impact dynamics, and proposed solutions are discussed. It is suggested that a Pedestrian Arrestor Device be developed which would stop the pedestrian before impact is made with the bumper, grill, or hood. An external air bag concept is suggested which would be used with some early warning device, activated at some minimum vehicle speed (5-10 mph) to allow time to deploy the arrestor prior to impact. The earliest preliminary design would suggest some kind of an inclined, mesh type screen. A new approach to front end design is advocated for prevention of injury to immature or elderly pedestrians.

by J. D. Baird; G. P. Jones  
University of Southern California, Los Angeles  
Publ: HS-015 190, International Congress on Automotive Safety (3rd) Proceedings. Vol.1, Washington, D. C., 1974 p18-1--18-10  
1974 ; 13refs  
Availability: Bound in HS-015 190

HS-015 203

**FACTORS IN URBAN VEHICLE PEDESTRIAN COLLISIONS**

Multidisciplinary accident investigations and computerized pedestrian accident records were used to determine factors in urban vehicle pedestrian collisions. Accident frequency variations are described, along with socioeconomic and land use factors, characteristics of participants, accident severity, intoxication and drinking, and typical collision patterns. Mea-

sures are suggested for pedestrian and driver education and training, long-term highway and environmental modifications, and inexpensive improvements in the design and operation procedures of streets and highways.

by K. J. Tharp; N. G. Tsongos  
Houston Univ., Tex.; National Hwy. Traf. Safety Administration, Washington, D. C.  
Publ: HS-015 190, International Congress on Automotive Safety (3rd) Proceedings. Vol. 1, Washington, D. C., 1974 p19-1--19-25  
1974  
Availability: Bound in HS-015 190

HS-015 204

**DROP TESTS OF DUMMIES ON A MOCK VEHICLE EXTERIOR**

Validation of a Collision Victim Simulation model is discussed along with measurement of the effectiveness of a relatively soft vehicle exterior material in minimizing pedestrian-vehicle impact severity. A series of controlled tests were conducted by dropping instrumented anthropometric dummies on an idealized vehicle exterior, with high-speed cameras recording the dummy's kinematics and accelerometers measuring accelerations at various body locations. Each dummy's mass distribution, segment moments of inertia, joint damping properties, geometry, and surface force deformation properties were measured. Force-deformation properties of the mock-up surface (polyurethane foam) were experimentally and analytically determined. Measurements of the coefficient of friction between the mock-up surface and the dummy's skin were also made. Test results show that the six-inch layer of polyurethane foam will not reduce the severity of impact appreciably, as compared with impacts with conventional automobiles.

by H. E. Ross, Jr.; M. C. White; R. D. Young  
Texas A and M Univ., College Station. Texas Transp. Inst. CONTRACT DOT-065-1-217  
Publ: HS-015 190, International Congress on Automotive Safety (3rd) Proceedings. Vol. 1, Washington, D. C., 1974 p20-1--20-52  
1974 ; 7refs  
Availability: Bound in HS-015 190

HS-015 205

**PEDESTRIANS AND BICYCLISTS: VEHICLE FACTORS IN ACCIDENT AND INJURY CAUSATION**

Vehicle factors in accident and injury causation in pedestrians and bicyclists are discussed. Pedestrian accident factors include car size, braking and swervability, visibility and conspicuity. For bicycle accidents they include rider behavior and visibility. Factors in injury causation are overall frontal shape, stiffness of impact areas, bumper height, front end design. It is concluded that: small cars have a lower involvement rate in pedestrian accidents than large cars; braking in a locked-wheel skid is the most common evasive maneuver used; many pedestrians do not recall seeing the approaching vehicle; vehicle factors are more significant in the causation of collisions between a car and an adult cyclist rather than in those involving a child cyclist; injury nature and severity is influenced by overall shape of the front of the car; the stiffness of the front of the hood of the striking car may be a less important factor in the production of pedestrian injury than either the overall shape of the front of the car or the location of the point of im-

pact; the standardized bumper height makes it more likely that a pedestrian will sustain a permanently disabling lower leg fracture when struck by a car than was the case with earlier lower bumpers; a cyclist is less likely to be as severely injured as a pedestrian when struck by a car if his seated height is greater than that of the leading edge of the hood of the car.

by A. J. McLean  
Adelaide Univ., S. A. (Australia). Road Accident Res. Unit  
Publ: HS-015 190, International Congress on Automotive Safety (3rd) Proceedings. Vol. 1, Washington, D. C., 1974 p21-1--21-15  
1974 ; 11refs  
Sponsored by the Australian Road Res. Board and the Insurance Inst. for Hwy. Safety.  
Availability: Bound in HS-015 190

## HS-015 206

### CHARACTERISTICS OF ALL 2-WHEELED VEHICLE ACCIDENTS (BICYCLES, MOPEDS AND MOTORCYCLES) IN THE TOKYO METROPOLIS

Characteristics of all two-wheeled vehicle accidents, including bicycles, mopeds, and motorcycles, in the Tokyo metropolis are described. An analysis of vehicle-to-vehicle accidents is made in terms of accident patterns. (Paper is incomplete.)

by T. Suzuki; H. Ochiai; K. Ishikawa; A. Hakariya  
Honda Driving Safety Promotion Center, Tokyo (Japan)  
Publ: HS-015 190, International Congress on Automotive Safety (3rd) Proceedings. Vol. 1, Washington, D. C., 1974 p22-1--22-24  
1974  
Availability: Bound in HS-015 190

## HS-015 207

### INTERNATIONAL CONGRESS ON AUTOMOTIVE SAFETY. (3RD) PROCEEDINGS, JULY 15-17, 1974, SAN FRANCISCO, CALIFORNIA. VOL. 2

National Motor Vehicle Safety Advisory Council, Washington, D. C.  
1974 ; 710p refs  
Includes HS-015 208--HS-015 228. 012Big versus small cars are examined in terms of future vehicle mix and automotive safety, and vehicle factors affecting pedestrian and bicyclist safety. Specific papers are given on: vehicle design for safety performance, compromises between safety, environment, protection, and energy conservation; and pedestrian and bicyclist conspicuity.  
Availability: GPO \$6.35

## HS-015 208

### THE DESIGN OF MOTOR VEHICLES FOR REDUCTION OF PEDESTRIAN FATALITIES

The computer program for performing optimization and sensitivity studies of vehicle design for pedestrian fatality reduction is described. Its major components are an optimizer, a vehicle/pedestrian impact simulator, and an injury severity index. Consideration is given to pedestrian accident conditions, vehicle design variables, and a population injury index. The vehicle design variables involved are vehicle shape and stiffness. In addition to determining the optimal vehicle design, the program will determine the changes in pedestrian injuries

which result when the optimal design is modified. The program is being tested, and optimal design for both standard size and compact size cars will be determined to help in experimental studies of vehicle designs in dummy and cadaver tests.

by M. K. Gagnon; R. N. Karnes; J. L. Tocher  
Boeing Computer Services, Inc., Seattle, Wash.  
DOT-HS-356-3-719  
Publ: HS-015 207, International Congress on Automotive Safety (3rd) Proceedings. Vol. 2, Washington, D. C., 1974 1--23-18  
1974 ; 19refs  
Availability: Bound in HS-015 207

## HS-015 209

### COMPATIBILITY OF TRAFFIC PARTICIPANTS

Traffic mix is determined to be compatible when the human injury survival criteria for car occupants and such other users as pedestrians and cyclists are not exceeded in traffic accidents. Consideration is given to accident analysis, pedestrian protection, and car collisions. The influence of injury speed is described, along with that of mass ratio, impact direction and point of contact, force deformation characteristics, and architecture of energy-absorbing structures. It is noted that the use of a representative vehicle simulated deformable barrier can be of great help toward compatibility.

by U. Seiffert; J. Hamilton; F. Boersch  
Volkswagenwerk A. G., Wolfsburg (West Germany)  
Publ: HS-015 207, International Congress on Automotive Safety (3rd) Proceedings. Vol. 2, Washington, D. C., 1974 1--24-23  
1974 ; 4refs  
Availability: Bound in HS-015 207

## HS-015 211

### A PARAMETRIC STUDY OF PEDESTRIAN INJURY

A four-segment, six degree-of-freedom model was developed to determine the statistical significance of parameters with respect to injury sustained by the pedestrian due to primary impact with the vehicle surfaces; identify generalized vehicle modifications that have potential in reducing injury; and investigate in more detail the effects of these modifications applied to certain regions of the vehicle's front end for specific pedestrian conditions. It is shown that the pedestrian's (adult or child) and orientation (facing or side toward vehicle) greatly influence his response and the subsequent location and severity of his injury. Muscle tension does not influence severity as much. Hood slope and stiffness modification are most effective. Adding two inches of padding to the bumper resulted in reduced chest accelerations and hip forces, but had negligible effect on head injury. Child chest accelerations are greater than those of adults, but the adults experience conditions of much more severe injury to the head and hips.

by T. F. MacLaughlin; S. Daniel, Jr.  
National Hwy. Traf. Safety Administration, Washington, D. C.  
Publ: HS-015 207, International Congress on Automotive Safety (3rd) Proceedings. Vol. 2, Washington, D. C., 1974 1--26-25  
1974 ; 42refs  
Availability: Bound in HS-015 207

HS-015 212

**SIMULATION OF THE PEDESTRIAN DURING VEHICLE IMPACT**

The development of an analytical tool which can be used for studying the effects of varying vehicle geometry and stiffness on pedestrian injury is discussed. The tool is a three-dimensional mathematical model of a victim (with 31 degrees-of-freedom) and an impacting vehicle whose shape and stiffness are specified as input. Victim modeling literature is reviewed, and vehicle-vehicle interaction is described. The computer simulation reported does predict the kinematics of a pedestrian struck by a vehicle and the g levels experienced by the victim; it does not duplicate test results, although it does compare well with the high-speed film results until after the dummy lost contact with the vehicle mock-up.

by R. D. Young; H. E. Ross, Jr.; W. F. Lammert  
Texas A and M Univ., College Station. Texas Transp. Inst.;  
Brown and Root, Inc., Houston, Tex.

CONTRACT DOT-065-1-217

Publ: HS-015 207, International Congress on Automotive  
Safety (3rd) Proceedings. Vol. 2, Washington, D. C., 1974 p27-  
1-27-35

1974 ; 28refs

Availability: Bound in HS-015 207

HS-015 213

**A STUDY OF STRUCTURAL AND RESTRAINT REQUIREMENTS FOR AUTOMOBILE CRASH SURVIVAL**

Conventional passenger car vehicles in the 1000-5000-lb weight range were examined and minimum structural changes were determined which would be required to establish 50 mph barrier and 80 mph car-to-car crash survivability. Simple analytical model results highlight the necessity for minimum and maximum effective frontal stiffness required to achieve crush and restraint system compatibility over the vehicle weight range studied. The conventional type vehicle was shown to be very crush critical because of the engine intrusion into the compartment. This was greatly improved by engine deflection. It was shown that increasing the structural hardness achieved the expected decrease in crush, but also increased the demands for restraint system improvements. A structural modification involving clearance between the front bumper and the engine block along with engine deflection provided a desirable improvement in barrier and car-to-car crash compatibility. These modifications are considered feasible and do not alter the basic vehicle frame and sheet metal structure. When coupled with advanced air cushion restraint systems, improved crush and restraint compatibility was achieved in car-to-car collisions involving vehicle weights from 2000 to 5000 lbs.

by J. E. Hofferberth; J. E. Tomassoni  
National Hwy. Traf. Safety Administration, Washington, D. C.  
Publ: HS-015 207, International Congress on Automotive  
Safety (3rd) Proceedings. Vol. 2, Washington, D. C. 1974 p28-  
1-28-88

1974 ; 9refs

Availability: Bound in HS-015 207

HS-015 214

**CRITICAL GROWING PROBLEMS IN TODAY'S TRAFFIC MIX**

Types and volumes of vehicles involved in the current American traffic mix are discussed. Passenger car registration increases are cited, along with increases in trucks and buses, travel trailers and motor homes, motorcycles and bicycles, and pedestrians. The complexities involved in planning, developing, and managing an economical and safe system of transportation integration are described.

by P. F. Hill

National Safety Council, Chicago, Ill.

Publ: HS-015 207, International Congress on Automotive  
Safety (3rd) Proceedings. Vol. 2, Washington, D. C. 1974 p29-  
1-29-6

1974

Availability: Bound in HS-015 207

HS-015 215

**AVAILABLE SYSTEM DESIGN PHILOSOPHIES IN THE SMALL CAR CRASH SAFETY PROBLEM**

The small car crash safety problem is visualized as a problem in unequal protection under regulation, with inequities in the bearing of costs and risks. A general organization of big car-small car crash protection is postulated, aimed at restoring equal crash protection to the small car occupant, the costs of restoring equality being borne by the larger car. Cost benefit analysis is applied to the entire system after the inequalities have been reduced. A considerable change in results appears to be possible by reversing the order in time at which economic and social justice philosophies are considered. An appendix provides technical observations for system design of an integrated big car-small car environment relationship.

by H. H. Wakeland

National Transp. Safety Board, Washington, D. C.

Publ: HS-015 207, International Congress on Automotive  
Safety (3rd) Proceedings. Vol. 2, Washington, D. C., 1974 p30-  
1-30-23

1974

Availability: Bound in HS-015 207

HS-015 216

**THE CASE FOR THE 3000 LB CAR**

Occupant safety in the 3000-lb car is discussed in comparisons of fatality rates in the United States and in Sweden. It is shown that vehicle crash performance in the future can be influenced to a large degree by careful crashworthiness design of smaller vehicles, use of available occupant restraint systems, introduction of new technology such as air bag restraint systems, and rigorous regular inspection of safety items of vehicles in use.

by A. Asberg; R. Melde; S. Bengtsson

Volvo A. B., Goteborg (Sweden)

Publ: HS-015 207, International Congress on Automotive  
Safety (3rd) Proceedings. Vol. 2, Washington, D. C., 1974 31-  
1-31-16

1974 ; 9refs

Availability: Bound in HS-015 207

HS-015 217

HSL 75-

HS-015 217

### **BICYCLES IN THE MODAL MIX--THE SCOPE OF THE PROBLEM**

Increased use of the bicycle in the United States is discussed, and modal mix problems related to it are considered. Legal factors, safety education, and driver training, especially for children, are described. The need for special facilities to provide separate streams of traffic, where bicycles and motor vehicles are not compatible, and other safety features is cited.

by J. J. Hayes

Bicycle Inst. of America, New York

Publ: HS-015 207, International Congress on Automotive Safety (3rd) Proceedings. Vol. 2, Washington, D. C., 1974 p32-1--32-11  
1974

Availability: Bound in HS-015 207

HS-015 218

### **RESPONSES OF THE LAW IN ABSORBING AND SHIFTING RISKS OF LOSSES STEMMING FROM AN INCREASED NUMBER OF SMALL CARS AND OTHER VEHICLES**

Broad principles and trends of state laws in making reparations to crash victims for losses resulting from personal injuries caused by collisions between big and small cars are discussed. The historical setting is reviewed, and consideration is given to no-fault reparations and automobile manufacturer liability. Court action to revamp the fault system with new theories of strict liability and crashworthiness is also mentioned.

by J. W. Little

Florida Univ., Gainesville, Holland Law Center

Publ: HS-015 207, International Congress on Automotive Safety (3rd) Proceedings. Vol. 2, Washington, D. C. 1974 34-1||34-24

1974 ; 25refs

Refs. 1-10 are omitted from paper.

Availability: Bound in HS-015 207

HS-015 219

### **PEDESTRIAN CONSPICUITY UNDER THE STANDARD HEADLIGHT SYSTEM RELATED TO DRIVER PERCEPTION**

Benchmarks were established as to viewer responses under one set of conditions, illuminated targets viewed at 550 feet under dark ambient light conditions as the parameters of target area and brightness were varied. Variable factors include high beam usage, target motion, windshield condition, weather, etc. The dangerously high estimate by a pedestrian of his own visibility is noted. It is emphasized that good visibility and timely perception of the pedestrian by the driver play an important role in accidents both day and night, but especially at night.

by R. L. Austin; D. J. Klassen; R. C. Vanstrum

Minnesota Mining and Mfg. Co., St. Paul

Publ: HS-015 207, International Congress on Automotive Safety (3rd) Proceedings. Vol. 2, Washington, D. C., 1974 p35-1--35-26 0071974 00815refs

Availability: Bound in HS-015 207

HS-015 220

### **HUMAN FACTOR CONSIDERATIONS IN VEHICLE, PEDESTRIAN AND BICYCLE SAFETY**

Basic skills and behaviors, factors affecting them, and the importance for vehicle, pedestrian and bicycle safety are discussed. The basic behaviors apply both to drivers and to pedestrians and riders, and they affect the interrelationship between all of them. Important factors include visual perception, judgment and response time, auditory perception, unexpected situations, haste, and day and night vision as affected by glare, lighting, day and night color contrast and brightness contrast. They must be taken into account by vehicle designer and by traffic engineers, and must be understood by all three participant groups.

by T. W. Forbes

Michigan State Univ., East Lansing. Hwy. Traf. Safety Center

Publ: HS-015 207, International Congress on Automotive Safety (3rd) Proceedings. Vol. 2, Washington, D. C., 1974 p37-1--37-16

1974 ; 12refs

Availability: Bound in HS-015 207

HS-015 221

### **IMPLICATIONS OF PEDESTRIAN ACCIDENT CHARACTERISTICS AND AVOIDANCE COUNTERMEASURES FOR VEHICLE DESIGN**

Vehicle design for pedestrian and bicyclist safety is viewed in the context of the characteristics of the pedestrian/bicycle accident problem and the point of view that the objective is to solve this casualty problem in a cost-effective manner, rather than a more specific focus on applying vehicle design solutions per se. Three main points are presented: there appear to be real and practical limits to injury reduction benefits that can be achieved; vehicle design does not mean only injury reduction, but also accident avoidance; and vehicle design and operational traffic safety countermeasures can influence the effectiveness of each other, and their interaction should be considered in the development of new countermeasures. Guidelines or generalizations are offered regarding the development and utilization of vehicle design solutions to the pedestrian/bicycle safety problem.

by M. B. Snyder

National Hwy. Traf. Safety Administration, Washington, D. C.

Publ: HS-015 207, International Congress on Automotive Safety (3rd) Proceedings. Vol. 2, Washington, D. C., 1974 p39-1--39-13

1974 ; 5refs

Availability: Bound in HS-015 207

HS-015 222

### **BIG CARS--SAFER FOR WHOM?**

Four statistical reports of traffic accidents are analyzed and hypotheses are explored, showing that from American society's point of view, small cars are significantly safer than large cars. It is shown that: large cars are involved more often in multi-car accidents than small cars in proportion to their exposure; large cars are involved more often in pedestrian accidents; when large and small cars collide, the driver of the large car is more often at fault; although small cars have a higher rate of involvement in single-car accidents, they are

burdened by a high proportion of accident-prone (under 25) drivers, by certain non-size-related instabilities, and by inclusion of accident-prone sports cars. Possible reasons for this relationship are: large car dimensions increase probability of collision (allowable driver error margin decreases with increased vehicle size); American cars (comprising all of the standard class) appear to have soft suspensions, increasing probability of loss of control in emergency; longer, wider hoods may decrease visibility; driver error probability may increase with vehicle size because of its scale relationship to him; and a greater than average proportion of big cars may be mechanically unsafe because of higher repair and maintenance costs and more rapid depreciation. Recommendations for further studies are included.

by S. Hart  
Hart (Stanley) and Associates, Altadena, Calif.  
Publ: HS-015 207, International Congress on Automotive Safety (3rd) Proceedings. Vol. 2, Washington, D. C., 1974 p40-1-40-39  
1974 ; 9refs  
Availability: Bound in HS-015 207

HS-015 223

### **PREDICTING THE PROBABILITY OF INJURY DURING HIGHWAY COLLISIONS. SUB-COMPACTS VS. STANDARD SIZE VEHICLES**

An analytical framework is developed, based when possible on empirical studies, in which the probability of injury in any specific acceleration producing event can be estimated. Several assumptions are made, and calculations are offered regarding tolerable accelerations. The equations developed are applied to guardrail, bridge rail, and median barrier collisions. It is shown that the probability of injury to small vehicle occupants in barrier collisions exceeds that of standard vehicle occupants by two to one. Seat belt usage laws are advocated as the most promising countermeasure. The analysis presented is considered qualitatively valid in other situations, such as collisions with other vehicles and collisions with crash cushions.

by D. L. Ivey  
Texas A and M Univ., College Station. Texas Transp. Inst.  
Publ: HS-015 207, International Congress on Automotive Safety (3rd) Proceedings. Vol. 2, Washington, D. C., 1974 p41-1-41-35  
1974 ; 20refs  
Availability: Bound in HS-015 207

HS-015 224

### **THE ACCIDENT AVOIDANCE POTENTIAL OF THE MOTOR VEHICLE: ACCIDENT DATA, VEHICLE HANDLING AND SAFETY STANDARDS**

A critical speed methodology developed for categorizing traffic accidents relative to handling accident causation factors is applied to the investigation of highway collisions. Although only limited experience with the new methodology has been collected to date in accident studies conducted by the multidisciplinary accident investigation team of the University of Utah, significant improvements in separating handling accident causation factors are possible. Post-accident driver interviewing as well as driver's education efforts may benefit greatly from an accident analysis clearly identifying environmental, vehicular, or operator causation factors. It is noted that refine-

ments to the procedures will be made as more detailed accident investigations are carried out. The method may be applied to police investigation procedures.

by R. Limpert; F. E. Gamero  
Utah Univ., Salt Lake City. Dept of Mechanical Engineering  
Publ: HS-015 207, International Congress on Automotive Safety (3rd) Proceedings. Vol. 2, Washington, D. C., 1974 p42-1-42-61  
1974 ; 28refs  
Availability: Bound in HS-015 207

HS-015 225

### **BIG AND LITTLE CAR COMPATIBILITY**

Research findings on large and small car compatibility are reported which reflect the conviction of researchers and policymakers of the need to approach automobile safety problems on the basis of total systems. The potential of hybrid energy management designs and improved restraint systems is emphasized. Energy-absorption equations are given for crash situations. Specific details are offered on: head-on impacts and occupant/survival space; hybrid requirements; survival via occupant restraints; desirable occupant load characteristics; car-to-car head-on aligned crashes; and occupant restraint load limiter. It is concluded that hybrid designs in conjunction with occupant restraints are capable of providing protection to their own occupants as well as the occupants of other vehicles with which severe collisions may occur.

by J. M. Kossar  
National Hwy. Traf. Safety Administration, Washington, D. C.  
Publ: HS-015 207, International Congress on Automotive Safety (3rd) Proceedings. Vol. 2, Washington, D. C. 1974 p43-1-43-121  
1974 ; 12refs  
Availability: Bound in HS-015 207

HS-015 226

### **THE REGULATED AUTOMOBILE, TRANSPORTATION POLICY AND THE ENERGY CRISIS: THE NEED FOR A BALANCED APPROACH**

Approaches to problems associated with the energy crisis are discussed. Consideration is given to manufacturers' regulation compliance (emission control, damageability), seat belt usage laws, vehicle weight standards, safety regulations, fuel conservation, highway maintenance financing, vehicle design (bumpers, side beams), increasing driving population, and traffic mix. A federal-level integrating agency or department is suggested to reconcile and establish priorities for all regulations governing the automobile, and to consider options other than regulation.

by F. M. Kreml  
Motor Vehicle Manufacturers Assoc. of the United States, Inc., Detroit, Mich.  
Publ: HS-015 207, International Congress on Automotive Safety (3rd) Proceedings. Vol. 2, Washington, D. C., 1974 p44-1-44-12  
1974  
Availability: Bound in HS-015 207

HS-015 227

HS-015 227

### **FUEL SAVINGS, SPEED AND FATALITY REDUCTIONS, TRAVEL TIME LOSSES: WHAT ARE THE ANALYTICAL RESEARCH REQUIREMENTS?**

Analytical research requirements are reviewed for fuel saving, speed and fatality reductions, and travel time losses. The effects of fuel shortages are outlined as speed limit reductions, fewer traffic accidents, and prolonged transportation times. Societal transactions of these effects are discussed. Calculations for lifetime gains resulting from accident fatalities prevented by lower speeds are made, and are related to the loss functions (time). Suggestions are given for assessing the optimal highway and traffic speeds.

by G. A. Hoffman  
University of Southern California, Los Angeles. Inst. of Safety and Systems Management  
Publ: HS-015 207, International Congress on Automotive Safety (3rd) Proceedings.  
1974  
Availability: Bound in HS-015 207

HS-015 228

### **HOW SAFE CAN WE BE IN SMALL CARS?**

Ways to offset the higher risk of serious injury in small-car accidents are discussed. After a review and summary of some of the statistical information on the relationships between vehicle weight and safety, the effects of various changes in the mix of vehicles are estimated. Conclusions are: a shift in U.S. passenger car population from its present weight distribution to primarily compact and subcompact cars could produce up to 25% more serious and fatal injuries; increased safety belt use could mitigate the harmful effects of weight reduction; it does not appear that a reduction in maximum speeds would by itself completely offset the effect of a shift to small cars; and restrictions on the sale or use of very small or very large cars would not be very effective as a countermeasure to reduced average car weight.

by D. F. Mela  
National Hwy. Traf. Safety Administration, Washington D. C.  
Publ: HS-015 207, International Congress on Automotive Safety (3rd) Proceedings. Vol. 2, Washington, D. C., 1974 p48-1-48-30  
1974; 18refs  
Availability: Bound in HS-015 207

HS-015 229

### **THE OPTIMUM METRIC FASTENER SYSTEM**

Conversion to the metric system of measurement is discussed as it applies to various fasteners. The scope of the fastener industry and its applications are noted, along with the activities and recommendations of a special study committee. Threaded fastener system goals are outlined. Special consideration is given to: diameter/pitch combinations; thread forms; gaging; bolt head design; materials and performance; inspection and quality assurance. Industrial management is alerted to the value of a coordinated, planned conversion to the metric system, based on: improved corporate worldwide standards and product rationalization; greater participation in developing metric worldwide standards reflecting superior design and manufacturing technology; and introduction of these upgraded

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standards into product development and production enough coordinated corporate planning that other possible improvements are also incorporated.

by S. E. Mallen  
Publ: Automotive Engineering v82 n8 21-9, 66, 68, 70, 72-3 (Aug 1974)  
1974  
Availability: See publication

HS-015 230

### **WHAT'S NEW IN DUMMIES**

Anthropomorphic test dummies are described which are used in studies of human response to impact. The General Motors developed Hybrid II is compared with human volunteer tests in terms of restraint systems, test environment, instrumentation and volunteer preparations. A general overview of the data shows that the anthropomorphic dummy dynamic response was conservative in comparison, with injury numbers for the dummies generally greater than those of the human subjects. This difference is described with regard to femur loads, ejection response to trauma and pain, head and thorax severities, air cushion system interactions, and column compression. Similar tests conducted with two of the original prototype Hybrid II anthropomorphic dummies are also discussed. Overall, the HSRI dummy exhibited slight repeatability and greater reproducibility advantages in component tests, while Hybrid II was superior in both in system tests. It is concluded that there are problems in integrating the components of the Hybrid II dummy into a total structure. Other comparisons are made in injury criteria, usability and durability. Advantages of a third dummy, the GM-ATD 502, developed by General Motors, are outlined as to assembly and movement, and the design of head, neck, shoulders, thorax, lumbar spine, and joints. Testing indicates that it can give repeatable responses under 5% variation in a hard-seat, three-point belt restraint system test.

Publ: Automotive Engineering v82 n8 p34-41, 65 (Aug 1974)  
1974  
Based on the following SAE PAPERS: SAE-740578, SAE-740588, AND SAE-740590, all presented at the 3rd International Conference on Occupant Protection, Troy, Mich., 10-12 Jul 1974.  
Availability: See publication

HS-015 231

### **ON-BOARD GENERATOR SUPPLIES HYDROGEN FOR I-C ENGINE**

A compact on-board hydrogen generator developed for use with a hydrogen enriched gasoline internal combustion engine is described. The unit uses gasoline and air in a partial oxidation reactor to produce a gaseous product containing hydrogen, carbon monoxide, minor amounts of methane, carbon dioxide, water and nitrogen. Consideration is given to thermal partial oxidation, catalytic partial oxidation, generator efficiency and overall system efficiency. It is shown that by adding hydrogen, leaner operation is possible with associated increases in engine efficiency.

Publ: Automotive Engineering v82 n8 p42-50 (Aug 1974)  
1974; Based on SAE-740600, "On-Board Hydrogen Generator for a Partial Hydrogen Injection I.C. Engine," by J. Housen and D. J. Cerini, Jet Propulsion Lab., Calif. Inst. of

Technology. Presented at the SAE National West Coast Meeting, Anaheim, 12-14 Aug 1974.  
Availability: See publication

HS-015 232

## **NINE WAYS TO GET BETTER FUEL MILEAGE**

The Shell Mileage Marathon is described as it suggests three major methods for improving fuel mileage: decrease rolling resistance and aerodynamic drag; increase engine efficiency; and use efficient driving techniques. Years of Marathon competition are discussed, and various vehicle modifications are reviewed. The record 376.59 miles per gallon is cited. Driving techniques are outlined, and nine specific ways to save fuel in current passenger cars are recommended.

Publ: Automotive Engineering v82 n8 p51-5 (Aug 1974)  
1974

Based on SAE-740620, "Nine Ways to Get Better Fuel Mileage" by D. L. Berry, Product Devel. Dept., Shell Oil Co. Presented at the SAE West Coast Meeting, 12-15 Aug 1974.  
Availability: See publication

HS-015 233

## **SAFETY WITH SANITY. PASSIVE AND PRACTICAL**

European approaches to vehicle safety design are discussed, with emphasis on 40 mph-impact tests standards for experimental safety vehicles (ESVs). Safety features relative to frontal and side impacts are described, such as front end lengthening, radiator mounting, crush zones, door latches, seat and head rest design, and bumper design. Design effects on pedestrian safety are also noted. Additional safety features considered include interior padding, pop-up headlights, fuel tank location, suspension system modifications, braking and decelerating stop lights, and tire modifications.

by A. Curtis; M. McCarthy; B Hatton

Publ: Motor (London) n3739 p32-7 (8 Jun 1974)  
1974

Availability: See publication

HS-015 234

## **SAFETY WITH SANITY. PT. 2. ESV'S COME TO TOWN**

Experimental safety vehicle (ESV) designs, foreign to Great Britain are described, many of which are aimed at 40 mph-impact protection, since most European and Japanese accidents occur at speeds less than 40 mph. Change of emphasis to the small, fuel-efficient vehicle is discussed, and proposals for future ESV safety standards are outlined. Compulsory seat belt usage is examined along with reports of head injuries incurred by seat belt-wearing drivers. It is shown that head injuries from hitting the steering wheel remain a problem in spite of reductions. Statistics on driver sex, bicycle and pedestrian accidents, and single versus multiple vehicle accidents are reported. Illustrations are provided of ESV models by Fiat, Honda, Toyota, Mercedes, Nissan, Opel, Peugeot, Volkswagen, and Renault.

by A. Curtis; M. McCarthy

Publ: Motor (London) n3740 p36-9 (15 Jun 1974)  
1974

Availability: See publication

HS-015 235

## **REPORT ON JOINT CONFERENCE ENO FOUNDATION BOARD OF DIRECTORS AND BOARD OF CONSULTANTS. NOVEMBER 7 AND 8, 1973. TRENDS IN TRANSPORTATION POLICY. ISSUES IN TRANSPORTATION DEVELOPMENT**

Trends in transportation policy at federal, state and local levels of government are discussed, along with some of the prevailing issues that affect transportation policy and development. Consideration is given to railroad problems, urban transportation, transit systems, highway transportation, environmental concerns, the New York Dept. of Transp., bond issues, federal aid and national policy, regional planning, restricted automobile use, revenue distribution, primary and secondary pollutants, motorist shift to transit, mass transit funding, transportation control plans, energy shortages, and conservation, transport of goods, intermodal facilities, land use control, nationalized railroads, and high-speed ground transportation.

Publ: Traffic Quarterly v28 n3 p325-70 (Jul 1974)  
1974 ; 1ref

Availability: See publication

HS-015 236

## **URBAN TRANSPORTATION ACCESSIBILITY MEASURES: MODIFICATIONS AND USES**

Various concepts and measures of urban transportation accessibility are examined. The use of accessibility measures in traffic and land-use modeling is discussed, and accessibility measures are suggested as adequate criteria for evaluating alternative transportation systems. Consideration is given to trip planning, land-use activities, traffic simulation models, and systems analysis. It is shown that accessibility is an important independent variable that should be considered in designing and developing models for predicting and evaluating traffic and land-use activities. A new formulation of accessibility, measured by the travel impedance and the interaction between land-use activities, is proposed. Its use in evaluating alternative transportation plans is found to be superior to the methods of cost-benefit analysis since it considers not only transportation costs but also the number of interacting land-use opportunities.

by T. Zakaria

Publ: Traffic Quarterly v28 n3 p467-79 (Jul 1974)  
1974 ; 17refs

Supported in part by the Urban Mass Transp. Administration.  
Availability: See publication

HS-015 237

## **THE ECONOMICS OF PRIVATE BUS SERVICES IN AUSTRALIA**

If private enterprise bus industry is to continue in providing its present level of transportation services, some form of governmental assistance to the industry is required. Those in the industry need to consider certain policy alternatives such as: exemption from fuel excise tax and sales tax on spare parts and tires; an increase in depreciation and investment allowances for vehicles; governmental loan schemes or direct government subsidies; rental of buses and the formation of public companies. Financial desirability of each is determined by its com-

bined effect on after-tax profit and the depreciation allowance. The overall desirability of an alternative is some combination of financial desirability, probability of implementation by the government, and the obligation placed on the industry after implementation.

by P. Gilmour  
 Publ: Traffic Quarterly v23 n3 p437-52 (Jul 1974)  
 1974 ; 3refs  
 Availability: See publication

HS-015 238

### **AN EMPIRICAL MODEL FOR AUTOMOBILE DRIVER HORIZONTAL CURVE NEGOTIATION**

Continuous recordings of test drivers on rural horizontal curves indicated that test drivers exhibited a nonlinear relation in velocity and lateral acceleration at the point of maximum acceleration. A model is proposed which includes a driver aspiration velocity, maximum lateral acceleration tolerance, and an expedience parameter related to the driver's willingness to trade velocity for lateral acceleration. The model provides a good fit to different types of data which include: relaxed drive vs. late for appointment scenarios, and familiarity of roadway. The empirical models indicate changes in the expedience parameter and aspiration velocity.

by G. D. Herrin; J. B. Neuhardt  
 Publ: Human Factors v16 n2 p129-33 (Apr 1974)  
 1974 ; 7refs  
 Supported by the Ohio Dept. of Hwys. and the Federal Hwy. Administration.  
 Availability: See publication

HS-015 239

### **LYTHGOE'S VISUAL STEREOPHENOMENON IN THE NATURAL ENVIRONMENT: A POSSIBLE FACTOR IN AIR AND HIGHWAY ACCIDENTS**

The path of a horizontally moving object, when viewed binocularly, appears distorted in depth if a light shines on only one of the observer's eyes. The image in the lighted eye has a shorter visual latency period than the image in the other eye, and this temporal difference between image latencies translates into an apparent spatial difference between image positions - binocular disparity - which results in the apparent depth displacement of the moving object. In the natural visual environment, one eye can be lighted by the sun while the other is shaded by the nose, and thus, distortions may be produced in the apparent paths of airplanes, or of traffic moving on the ground. The roles that such distortions may play in some air and highway accidents have not been considered previously, and it is suggested that workers concerned with air and highway safety will consider the possible implications of the observations and speculations presented.

by J. T. Walker  
 Publ: Human Factors v16 n2 p134-8 (Apr 1974)  
 1974 ; 10refs  
 Availability: See publication

HS-015 240

### **DETECTION OF THE SIGN OF RELATIVE MOTION WHEN FOLLOWING A VEHICLE**

The ability to detect the sign of relative motion in the driving situation was investigated on a freeway. Subject passengers in a specially instrumented vehicle were given controlled looks, normally of four seconds duration, of a lead car. They were to estimate whether the two cars had come closer or moved further apart during the exposure. The comparative ability of nine stimulus functions to predict the detection of the sign of relative motion was examined. The most consistent results were obtained when it was assumed that the response was to either the average value of relative speed during the exposure divided by spacing or to the spacing change divided by spacing. One of the most consistent effects observed was a response bias in favor of indicating that the cars had come closer when they had not. Considerable sensitivity to the sign of relative motion is indicated.

by L. Evans; R. Rothery  
 Publ: Human Factors v16 n2 p161-73 (Apr 1974)  
 1974 ; 18refs  
 Availability: See publication

HS-015 241

### **EFFECTS OF ALCOHOL ON PERIPHERAL VISION AS A FUNCTION OF ATTENTION**

Twelve males were tested for the effects of alcohol upon peripheral vision under three levels of central visual information processing demand to test the hypothesis that alcohol would affect detection of lights in the periphery only when the subjects were required to process information simultaneously from central vision. They were required to fixate either on a steady-state central fixation light and detect peripheral lights or to count blinks produced by the cessations of the fixation light and to detect peripheral lights. Alcohol produced an impairment of peripheral vision only under conditions where the central fixation light blinked and thus required information processing. No performance decrement occurred when the central light did not blink. The results suggest that alcohol interferes with central information processing rather than peripheral sensory mechanisms.

by H. Moskowitz; S. Sharma  
 GRANT MH-18088  
 Publ: Human Factors v16 n2 p174-80 (Apr 1974)  
 1974 ; 13refs  
 Supported by the National Inst. of Alcohol Abuse and Alcoholism  
 Availability: See publication

HS-015 242

### **DIVIDED COMBUSTION CHAMBER GASOLINE ENGINES. A REVIEW FOR EMISSIONS AND EFFICIENCY**

A general classification of gasoline engines is presented to facilitate the distinction among different engine types. The classification contains the group of stratified charge engines, and shows that, within this group, the divided combustion chamber engine type constitutes a major subdivision. Three characteristic designs of this type of engine are detailed, and fuel economy and emission results are presented. Data ob-

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tained with one of these engines indicate excellent fuel consumptions, showing at light loads values close to those achieved by diesel engines. Data also show that automobiles equipped with another of the engines described have passed, with ample margin, the 1975 federal Emission Standards, without added devices for exhaust gas treatment, while maintaining satisfactory fuel economy. Some aims that should be pursued to achieve, simultaneously, both the optimal fuel economy and emission reduction potential of the stratified engine are outlined. It is concluded that substantial improvements should yet be expected if the proven advantages of the divided combustion chamber engine are recognized and sufficient efforts are applied for further development.

by J. L. Bascunana  
Publ: Journal of the Air Pollution Control Association v24 n7  
p674-9 (Jul 1974)  
Rept. No. APCA-Paper 73-74 ; 1974 ; 26refs  
Presented at the 66th Annual Meeting of APCA, Chicago, Jun 1973.  
Availability: See publication

HS-015 243

### **REPRIEVE ON SLAUGHTER ALLEY. 3700 MOTORISTS OWE THEIR LIVES TO THE 55 MPH LIMIT. OR DO THEY?**

Effects of the energy crisis-provoked 55 mph speed limit are examined, and views opposing its value are discussed. Reductions in traffic fatalities are noted but are not assumed to result solely from the lower speed limit, or from travel reduction. Attitudes of various public officials and agencies are reviewed, and the complexities involved in accident statistics are cited.

by F. M. H. Gregory  
Publ: Motor Trend v25 n6 p96-101 (Aug 1974)  
1974  
Availability: See publication

HS-015 244

### **SUSPENSION TUNE: FORD PINTO**

The Ford Pinto suspension system is discussed and methods of handling a do-it-yourself suspension tune-up are presented. Specific suspension kits publicly available are described. It is shown that the Ford HD suspension is the most cost-effective but not the most efficient set of components. The Sparco suspension is quite flexible with the multitude of antisway bars offered, but it needs a positive-type differential to work most effectively. The Interpart kit with a standard type differential is recommended, since it offers potential for better handling with simple adjustments.

by D. Sherman  
Publ: Car and Driver v20 n2 p63-9 (Aug 1974)  
1974  
Availability: See publication

HS-015 245

### **MOTOR CARRIER ACCIDENT INVESTIGATION. CRITES TRANSFER ACCIDENT--JULY 3, 1973--**

### **CUMBERLAND, MARYLAND 005Bureau of Motor Carrier Safety, Washington, D. C.**

An accident between a bobtail truck tractor, Volkswagen, and Ford is reported which occurred as the truck tractor skidded across the centerline upon brake application, sideswiped the oncoming Ford and slid counter-clockwise, striking the Volkswagen. Three fatalities, one injury, and \$3000 property damage resulted. The probable cause was determined to be truck speed too fast for existing conditions, coupled with brake application on wet pavement, and loss of control.

1974 ; 11p  
Availability: Corporate author

HS-015 246

### **TEACHING CHILDREN PEDESTRIAN SAFETY. INJURY CONTROL CURRICULUM GUIDE (FOR K- 3RD GRADE). 2ND ED.**

A curriculum guide for teaching prevention of death or injury of young children, kindergarten through third grade, by automobile, truck, bus, pedestrian, bicycle and tricycle accidents is presented. Concepts, behavioral objectives, and learning episodes are given for pedestrian and vehicle safety, and evaluation procedures are outlined. An annotated film bibliography is included, along with suggestions for finger puppets, traffic songs, traffic tally sheets, other activities, and traffic symbols and emblems.

by R. B. Woolner, ed.  
Memphis and Shelby County Traf. Safety Coordinating Com.  
Tenn.; Memphis and Shelby County Health Dept., Tenn.  
1972 ; 113p  
Sponsored by the National Hwy. Traf. Safety Administration.  
Availability: Corporate authors

HS-015 247

### **ACCIDENTS OF LARGE MOTOR CARRIERS OF PROPERTY 1971-1972**

Accident statistics involving commercial motor vehicles is presented for 1971 and 1972. The reports give: intercity accidents and vehicle miles by region and by commodity; age of drivers in moving vehicle accidents; type of accidents; further breakdown of accidents by type; and vehicles involved in accidents by commodity. A Federal Highway Administration regional map is included. Appendices compare old and new Federal Highway Administration regions, and selected accident statistics for 1960-1972 are given. Graphs are included on accident and fatality rates by vehicle miles, fatality rate per 100 accidents, driver injuries and fatalities, and accidents and fatalities for selected freight classifications.

Bureau of Motor Carrier Safety, Washington, D. C.  
1974 ; 41p  
Availability: Corporate author

HS-015 248

### **STEERING WHEEL RESPONSE UNDER VARIOUS HEADLIGHTING CONDITIONS**

The hypothesis that a driver will change his steering input under different headlighting conditions was examined and sup-

ported. The differences between the glare and non-glare conditions and between the high and low beam glare conditions were significant and in the expected direction for percentage of high frequency area, reversals of 2-8 degrees, proportion of time moving the wheel, speed of moving the wheel, and distance through which the steering wheel travelled. The differences between the two non-glare conditions, though not significant for any variable measured, were in the expected direction for the proportion of time moving the wheel and distance through which the steering wheel travelled. No clear trend was observed between these conditions for percentage of high frequency area, reversals of 2-8 degrees and speed of moving the steering wheel.

by A. M. Smiley  
National Aeronautical Establishment, Ottawa, Ont. (Canada)  
Rept. No. LTR-ST. 708 ; 1974 ; 19p 7refs  
Availability: Corporate author

HS-015 249

#### **MEASURED ILLUMINATION CHARACTERISTICS OF THE 1973 HEADLAMPS**

The measured illumination characteristics of the 67 ECE and SAE-type headlamps are detailed. The illumination procedure is described in order to demonstrate the form of the illumination data. Various headlamp characteristics and measurement parameters are listed, and a note is included explaining the storage of the illumination datasets for the headlamps. The intensity map form for the illumination data is discussed so as to demonstrate its preference for use in later illumination calculations. Contour plots of the intensity maps for the various headlamps reveal quickly and simply the illumination characteristics.

by A. L. Harrison  
National Aeronautical Establishment, Ottawa, Ont. (Canada)  
Rept. No. LTR-ST. 707 ; 1974 ; 95p 4refs  
Availability: Corporate author

HS-015 250

#### **MOTORCYCLE TRAINING--STANDARDS FOR SURVIVAL**

Trends in motorcycle accidents are reviewed, and it is suggested that many collisions are due to automobile driver error, and a lack of skill and experience on the part of the motorcycle operator. Techniques for avoiding collision are submitted and the incorporation of these in Canadian motorcycle training courses reported. The development of the Canadian National Motorcycle Training Program under the auspices of the Canada Safety Council is described. Factors affecting the establishment of training, the selection of instructors, a course syllabus, and a final test are appended.

by S. Munro  
Canada Ministry of Transport, Ottawa, Ont. Road and Motor Vehicle Traf. Safety  
1974 ; 26p 9refs  
Availability: Corporate author

HS-015 251

#### **CONVERSION OF STATE ACCIDENT DATA TO UNIFORM ACCIDENT DATA TAPE FORMAT. STATE OF VIRGINIA. 1972 ACCIDENT YEAR**

The conversion of 1972 Virginia state accident data to uniform accident data format is described. Uniform accident data tape and data element availability are presented along with the conversion logic. Materials given include accident report forms, mechanical tabulation of accident reports, and record layout.

Safety Management Inst., Washington, D. C.  
CONTRACT DOT-HS-021-2-472  
1973 ; 110p  
Availability: Reference copy only

HS-015 252

#### **CONVERSION OF STATE ACCIDENT DATA TO UNIFORM ACCIDENT DATA TAPE FORMAT. COMMONWEALTH OF PENNSYLVANIA. 1972 ACCIDENT YEAR**

The conversion of 1972 Pennsylvania state accident data to uniform accident data format is described. Uniform accident data tape and data element availability are presented along with the conversion logic. Materials given include: codir sheet accident record; police accident report; file layout form official accident analysis; and coding manual.

Safety Management Inst., Washington, D. C.  
CONTRACT DOT-HS-021-2-472  
1973 ; 183p  
Availability: Reference copy only

HS-015 253

#### **CONVERSION OF STATE ACCIDENT DATA TO UNIFORM ACCIDENT DATA TAPE FORMAT. DISTRICT OF COLUMBIA. 1971 ACCIDENT YEAR**

The conversion of 1971 District of Columbia accident data to uniform accident data format is presented. Uniform accident data tape and data element availability are described along with the conversion logic. Materials considered include data pertinent to the tape layout, coding instructions, and record layout.

Safety Management Inst., Washington, D. C.  
CONTRACT DOT-HS-021-2-472  
1973 ; 97p  
Availability: Reference copy only

HS-015 254

#### **CONVERSION OF STATE ACCIDENT DATA TO UNIFORM ACCIDENT DATA TAPE FORMAT. STATE OF CALIFORNIA. 1972 ACCIDENT YEAR**

The conversion of 1972 California state accident data to uniform accident data format is presented. Uniform accident data tape and data element availability are given, and materials

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used are shown, including data processing data sheets and coding instructions.

Safety Management Inst., Washington, D. C.  
CONTRACT DOT-HS-021-2-472  
1973 ; 178p  
Availability: Reference copy only

HS-015 255

### **CONVERSION OF STATE ACCIDENT DATA TO UNIFORM ACCIDENT DATA TAPE FORMAT. STATE OF MARYLAND. 1973 ACCIDENT YEAR**

The conversion of Maryland state accident data to a uniform accident data format for 1973 is presented. The materials used include accident reports and accident report files. The definition and flow of data elements are described along with the conversion logic, and a preparation manual is detailed.

Safety Management Inst., Washington, D. C.  
CONTRACT DOT-HS-021-2-472  
1973 ; 307p 8refs  
Availability: Reference copy only

HS-015 256

### **TIRE TRACTION: NEW INSIGHTS FROM RESEARCH**

Tire traction research findings are reviewed. The development of an analytical model that predicts fluid flow beneath a hydroplaning tire is described, along with a new technique for measuring the deformation of the sidewalls and tread surfaces of tires under operating conditions.

by E. Mazzatenta  
Publ: Search v9 n4 pl-4 (Jul-Aug 1974)  
1974 ; 3refs  
Availability: See publication

HS-015 257

### **THE TRAFFIC CONFLICTS TECHNIQUE: AN ACCIDENT PREDICTION METHOD**

A traffic conflicts technique, developed as a method of measuring accident potential and based on tabulation of evasive maneuvers as evidenced by brake-light indications and lane changes, is evaluated in an Ohio program. During 1972 and the first half of 1973, the Ohio data base was enlarged from 196 projects to 410 projects providing 922 approaches, of which 611 were usable for analysis purposes. A series of regression models was applied to this enlarged data base in an attempt to find a reliable accident prediction model. As a result, accident prediction algorithms were developed that provide a mean accuracy of plus or minus 1.1 accidents per year and a 75th percentile accuracy of plus or minus 1.8 accidents per year. In addition, substantial insight into the workings of the conflicts technique has been obtained.

by R. D. Paddock  
Publ: Transport Research Record n486 pl-10 (1974)  
1974 ; 4refs  
Sponsored by the Committee on Traf. Records.  
Availability: See publication

HS-015 259

HS-015 258

### **ENVIRONMENTAL DETERMINANTS OF TRAFFIC ACCIDENTS: AN ALTERNATE MODEL**

Identification and quantification of environmental determinants of traffic accidents are examined along with the construction of a conceptual model of traffic accidents based on environmental factors. Dependent variables include accident numbers and rates (number of accidents per million vehicle-miles of travel). Independent variables include physical characteristics of the road, road frontage (adjacent land use), and physical and social characteristics of the region. Data are derived from a sample of 135 road segments, each two miles long, in Oakland County, Michigan. A wide range of environmental characteristics are represented. Automatic interaction detection, multiple classification analysis, and multiple regression techniques are used to construct a series of predictive models. Analysis indicates that the number of accidents on a road segment is best predicted from traffic volumes and accident rates, whereas accident rates are best predicted from the type of road, the intensity of road frontage development, and the percentage of population between 16 and 24. Inspection of the formulated models suggests a conceptual macromodel that is different from traditional models of traffic accidents.

by J. C. Snyder  
Publ: Transport Research Record n486 p11-8 (1974)  
1974 ; 2refs  
Sponsored by the Committee on Traf. Records. Part of  
Doctoral dissertation, Michigan Univ.  
Availability: See publication

HS-015 259

### **TRUCK SPEEDS AND ACCIDENTS ON INTERSTATE HIGHWAYS**

The effectiveness and desirability of the differential truck speed limit on Interstate facilities in Maryland are evaluated, and the operational implications of changing this limit are examined. The research effort was directed toward: determining the degree to which trucks comply with existing speed limits; developing a procedure for comparing truck speeds and accident rates on particular sections of highway; and determining the likely operational impact of modifying differential truck speed limits on interstate highways. Vehicular speed and accident data were collected and analyzed for 84 study sites located on interstate, U.S., and state routes in Maryland. Multiple regression techniques were used to determine whether a significant relationship could be found among speed parameters, accidents, and accident rates. Attempts were made to develop models for the prediction of truck accident rates on limited-access facilities. The existence of a posted differential speed limit was not found to be related to truck accidents, although truck compliance with the differential limit was comparatively low. It was not possible to develop a statistically significant equation for the prediction of the overall rate of truck accidents. Significant equations that are capable of explaining truck accident and involvement variables by changes in traffic speed parameters were developed. The impact of modifying the differential truck speed limit could not be deter-

mined with certainty, but it was suggested that the limit be temporarily altered on a test section.

by J. W. Hall; L. V. Dickinson, Jr.  
 Publ: Transport Research Record n486 p19-32 (1974)  
 1974 ; 8refs  
 Sponsored by the Committee on Traf. Control Devices.  
 Availability: See publication

HS-015 260

### AN ACCIDENT EVALUATION ANALYSIS

A quantitative means of comparing accident histories at intersections is developed. The severity and type of accident are considered along with accident frequency. Based on cost figures gathered from several published studies of accidents in Illinois, Washington, D. C., AND Texas, accident severity weightings are obtained. An accident evaluation index and accident evaluation factors are computed by using percentage distribution of accidents by type. The accident evaluation factors are multipliers that, when applied to an accident history profile for an intersection, yield a single figure of merit.

by P. Abramson  
 Publ: Transport Research Record n486 p33-41 (1974)  
 1974 ; 13refs  
 Sponsored by the Committee on Traf. Control Devices, and the American Assoc. of State Hwy. Officials, in cooperation with the Federal Hwy. Administration. Conducted under The National Cooperative Hwy. Res. Prog.  
 Availability: See publication

HS-015 261

### THE PUBLIC COST OF MOTOR VEHICLE FIRES IN 1973: A STUDY IN FIRE DEPARTMENT COST ALLOCATION

The cost elements comprising the estimated total 1973 public cost of fire protection and the portion allocated to motor vehicle fires are summarized, with related incidents under a fully distributed cost analysis included. The overhead cost allocation of paid and mixed fire suppression expenditures dominates both the overall social cost of fire protection and the portion represented by motor vehicle fires and related incidents. In addition to their high frequency and considerable cost, vehicle fires and fire-related incidents pose special problems for local authorities, such as lack of local control of manufacturing standards to comply with fire codes, and prevention and limitation of crash-caused fuel spillage.

by E. M. Trisko; E. W. Shomo  
 Nathan (Robert R.) Associates, Inc., Washington, D. C.  
 1973 ; 27p 4refs  
 Sponsored by the Insurance Inst. for Hwy. Safety. Also published in Governmental Finance p24ff (Nov 1974).  
 Availability: Insurance Institute for Highway Safety, Washington, D.C.

HS-015 262

### SCHOOL BUS ACCIDENTS IN WESTERN NEW YORK STATE FOR 1971

The 99 reported accidents involving school buses in Western New York are compared with those throughout the state. It is noted that hospital treatment was required for bus occupants

in only eight of the 47 fatal or injury accidents for the Western New York area. Statistical data are given on: bus make a year; accidents by type and location (injury producing, property damage); accidents by type and injury; road condition; driver records, sex, and age. It is concluded that in bus-vehicle collisions, the occupants of the other vehicle are more likely to be injured than those in the bus. There were no property damage only single vehicle school bus accidents reported; were injury producing. Drivers have a significant number accidents and convictions on their records.

by S. W. Chesley  
 Calspan Corp., Buffalo, N. Y.  
 1973 ; 22p  
 Included in HS-801 025.  
 Availability: Bound in HS-801 025

HS-015 263

### ROADSIDE BREATH TESTER USE

The use of roadside breath testers (RBT) is advocated in cooperative program between DOT and Kemper Insurance Company. The RBT is a hand-held breath alcohol sensing device that enables an officer to determine at the roadside, before an arrest is made, the amount of alcohol in the blood of a motorist who appears to be intoxicated. Field tests throughout the country are described, many in conjunction with Alcohol Safety Action Projects, and legal procedures concerning RBT use are outlined. A Kemper educational program is also described, including a mini-computer used to compare body weight with the amount of alcohol theoretically consumed in order to show people what their personal legal limit is. Reasons for insurance industry interest in the drinking driver problem are outlined.

by S. Lesnik  
 Publ: Traffic Safety v74 n8 p22-4, 36-7 (Aug 1974)  
 1974  
 Availability: See publication

HS-015 264

### EFFECTS OF ISONIAZID ON PSYCHOMOTOR SKILLS RELATED TO DRIVING

The effects of isoniazid (INH) on human psychomotor skills related to driving were examined, with special interest focusing on the interaction between INH and alcohol. Volunteer cadets (100) were tested with a battery of a choice reaction test, coordination tests, and an attention test. Fifty drivers from motorized troops drove a simulator for 40 mins. Both INH and alcohol slightly elevated the subjective feeling of performance impairing attention. Both shortened reaction time, and INH also improved coordination at 90 and 150 mins after drug intake. No major interaction was observed between INH and alcohol in psychomotor tests. In simulated driving, INH antagonized the deleterious effect of alcohol on attention.

by M. Linnoila; M. J. Mattila  
 Publ: Journal of Clinical Pharmacology v13 p343-50 (Aug-Sep 1973)  
 1973 ; 14refs  
 Sponsored by Suomen Kulttuurirahasto, Tampere Tuberculosis Foundation, Liikennevakuutusyhdistys, and by Liikenneturva Finland.  
 Availability: See publication

HS-015 265

# **NATIONWIDE PERSONAL TRANSPORTATION STUDY. REPORT NO. 10. PURPOSES OF AUTOMOBILE TRIPS AND TRAVEL**

Data relating to the four major purposes of automobile trips and travel in the United States are presented, compiled from the Nationwide Personal Transportation Survey. The four major purposes are shown to be: earning a living; family business; educational, civic and religious; and social and recreational. Distribution of automobile trips and vehicle-miles of travel by trip purpose are discussed as related to population size-groups in incorporated places and unincorporated areas (as well as Standard Metropolitan Statistical Areas), trip length, age of driver, occupation, household income, hour of the day trip started, day of week, season of year, and number of occupants per trip. The relationship of the number of cars owned per household to the distribution of trips and vehicle-miles of travel are also examined by trip purpose and trip length. Daily and annual tripmaking rates are included.

by R. H. Asin  
Federal Hwy. Administration, Washington, D. C.  
Rept. No. 10 ; 1974 ; 101p  
Availability: Corporate author

HS-015 266

# **HIGHWAY INFORMATION SYSTEM. VOL. 1: USER INFORMATION**

User information of the Montana Highway Information System (HIS), a set of programs, data files, and summary files, is presented. Chapters are provided on: roadlog user information; traffic and true mileage user information; accident user information; sufficiency user information; preliminary study of retrieval of roadway geometric information; storage and retrieval of visual information; and accident analysis.

by G. L. Martin; L. J. Coats; M. J. Meldahl  
Montana State Univ., Bozeman. Dept. of Civil Engineering and Engineering Mechanics  
1972 ; 182p  
Sponsored by the State of Montana Dept. of Hwys. in cooperation with the Federal Hwy. Administration.  
Availability: Corporate author

HS-015 267

# **PENNSYLVANIA'S ACCIDENT RECORD SYSTEM**

The Accident Record and Analysis System, operative in Pennsylvania since 1966, is described. The informational subsystems deal with drivers, vehicles, road, police and insurance activity, traffic courts, and emergency services. Implicit in the system is the potential and real time linkage between accident data and the other system elements of concern. Appendices provide procedures and examples of specific reports.

Pennsylvania Dept. of Trans., Harrisburg. Bureau of Accident Analysis  
Rept. No. Pub-97 ; 1973 ; 160p  
Availability: Corporate author

HS-015 268

# **TRAFFIC ACCIDENT INFORMATION SYSTEM. CITY OF CHULA VISTA. FINAL REPORT**

The computerized Traffic Accident Information System of San Diego County, California, is described in procedure-manual form. The system has four major subsystems, each an independent computer system in itself. Sections of the manual deal with subsystem narrative, data flow from source, computer processing, distribution of output, input preparation rules, data conversion rules, and the computer system flow diagram. Specific subsystems are for: collision history master file update and reporting; collision detail/summary location reports; route segment collision summary; and collision category location report.

Optner (Stanford L.) and Associates, Inc., Los Angeles, Calif. 1973 ; 121p  
Prepared in cooperation with the State of Calif., Business and Transp. Agency, National Hwy. Traf. Safety Administration, and Federal Hwy. Administration.  
Availability: City of Chula Vista, 276 Fourth Ave., Chula Vista, Calif.

HS-015 269

# **DEVELOP AND IMPLEMENT A COMPUTERIZED TRAFFIC RECORDS SYSTEM. FINAL REPORT**

The Oxnard, California, Traffic Records Project is summarized, including computer-related specifications, programming detail, and documentation. The system's key feature, the Selective Retrieval Sub-System, is also described. The system provides identification of hazardous locations, before and after studies, improved use of selective enforcement, and selective data retrieval. It is used by traffic law enforcement and traffic engineering personnel.

Young (Arthur) and Co., Sacramento, Calif.  
Rept. No. R-111 ; 1973 ; 212p  
Prepared for the City of Oxnard, Calif. with the support of the Office of Traf. Safety, State of Calif., and the National Hwy. Traf. Safety Administration.  
Availability: City of Oxnard, Oxnard Traffic Records, P. O. Box 1192, Oxnard, Calif. 93030

HS-015 271

# **INVENTORY AND EVALUATION OF ROADWAY ELEMENTS. FINAL REPORTS**

Kings County, California, roads were surveyed and data were obtained on physical characteristics of the roadway including any physical obstruction that may increase the hazards to traffic. Traffic accident data were correlated to the roadway inventory so that county-wide accident patterns could be established. Computer programs were developed to produce reports itemizing the roadway inventory so that roadway or roadside conditions could be readily reviewed for their possible effect on causing specific accidents.

by H. W. Verheul  
Kings County Public Works Dept., Handford, Calif. 1973 ; 14p  
Sponsored by the office of Traf. Safety, State of Calif., and the National Hwy. Traf. Safety Administration.  
Availability: Corporate author

HS-015 272

### COUNTY OF KINGS ROADWAY INVENTORY SYSTEM USERS MANUAL

The Inventory and Evaluation of Roadway Elements Systems of Kings County, California, is described, which compiles roadway information for the evaluation of possible causes of highway accidents on rural county roads. The system contains four parts, the first involving gathering information about the physical features forming the county rural roads. In the second part the roadway information is keypunched and placed on magnetic tape for further storage and processing. Reports and summaries are supplied in the third part. Part four involves the updating of information on tape, including the addition of accident data. Procedures and examples are given.

Kings County Public Works Dept., Handford, Calif.  
1974 ; 40p

Availability: Corporate author

HS-015 273

### DIRECT ARTERIAL PRESSURE AND ELECTROCARDIOGRAM DURING MOTOR CAR DRIVING

Direct arterial pressure and electrocardiogram were measured continuously over a period of 24 hours in 15 patients whose behavior was observed during 30 separate episodes of automobile driving. The patients were divided into three groups: five normotensive subjects, five with essential hypertensive who were not receiving therapy, and five with angina pectoris who were either normotensive or hypertensive. In all but one subject, apart from variable changes in heart rate, no significant arrhythmias or S-T segment changes were observed in the electrocardiogram. The arterial pressure remained stable throughout the driving period in all three groups and there was no significant difference between the levels of blood pressure at the beginning and end of a journey. There were short periods of raised arterial pressure during driving related to such episodes as overtaking, but these quickly returned to baseline levels. Two patients experienced anginal pain during driving. It is concluded that driving does not have such a pronounced effect on the blood pressure as might have been expected.

by W. A. Littler; A. J. Honour; P. Sleight  
Publ: British Medical Journal v2 p273-7 (5 May 1973)  
1973 ; 8refs

Supported in part by the British Heart Foundation.  
Availability: See publication

HS-015 274

### ALCOHOLISM AND ROAD ACCIDENTS

The driving histories of 100 male alcoholics and 80 control drivers confirm that alcoholics accumulate a significantly increased incidence of road accidents and prosecutions. Some 45.9% of the prosecutions of the alcoholic group involved drunken or drunken and dangerous driving; in 44% of the accidents, alcohol played a significant part. It is shown that the official figures for drunken driving and accidents involving alcohol in Ireland are not sufficiently detailed to allow a clear perspective to be obtained. The belief is confirmed that an accident or prosecution involving alcohol occurs early in an al-

coholic's history. It is noted that many alcoholics do receive formal treatment for their alcoholism for several y

by A. W. Clare; J. G. Cooney  
Publ: Journal of the Irish Medical Association v66 n11 p28 (9 Jun 1973)  
1973 ; 25refs  
Availability: See publication

HS-015 275

### THE CONSTITUTIONALITY OF MANDATORY SEAT BELT USE LEGISLATION

Several trends indicate that mandatory seat belt use legislation is to be expected within the near future. The constitution of such self-protective legislation has been speculated. Constitutional challenges are expected in the areas of due process, equal protection, and right to privacy. Recent decisions dealing with motorcycle helmet legislation form a basis for discussion of the constitutional issues involved. These decisions illustrate principles upon which the courts could sustain mandatory belt use legislation as constitutionally valid.

by W. A. Ames  
Virginia Hwy. Res. Council, Charlottesville, Va.  
Rept. No. VHRC-72-R15 ; 1972 ; 21p 47refs  
Sponsored by the Hwy. Safety Div. of Virginia.  
Availability: Corporate author

HS-015 277

### SAFETY BELT USE IN AUTOMOBILES WITH STARTER-INTERLOCK AND BUZZER-LIGHT REMINDER SYSTEMS

Safety belt use was shown to increase in urban areas by introduction of the interlock system in 1974 vehicles. At least a lap belt was in use twice as frequently in 1974 vehicles equipped with the interlock system as in 1973 vehicles equipped with the buzzer-light system observed under same conditions; but 41% of the 1974 vehicle-drivers were using any belts. A large difference among usage rates in vehicles produced by different manufacturers is noted. Smaller, nonexistent differences in belt usage were found between age, sex, and age groupings. The validation study shows serious underestimation of lap belt use without the shoulder harness but the error is less than that found in studies finding overestimates using interviews. The impact on public health policy and safety regulations is noted.

by L. S. Robertson  
Insurance Inst. for Hwy. Safety, Washington, D. C.  
1974 ; 31p 24refs  
Availability: Corporate author

HS-015 278

### EMISSION CONTROL WITH LEAN OPERATION USING HYDROGEN-SUPPLEMENTED FUEL

Hydrogen-supplemented fuel was investigated as a means of extending lean operating limits of gasoline engines for control of nitrogen oxides. Single-cylinder engine tests with small additions of hydrogen to the fuel resulted in very low nitrogen oxide and carbon monoxide emissions for hydrogen-isooctane mixtures leaner than 0.55 equivalence ratio. Significant ther-

efficiency improvements resulted from the extension beyond iso-octane lean limit operation. Hydrocarbon emissions increased markedly at these lean conditions. Emissions of a passenger car modified to operate at 0.55-0.65 equivalence ratio with supplemental hydrogen showed the same trends as the single-cylinder engine tests. The success of the hydrogen-supplemented fuel approach will hinge on the development of both a means of controlling hydrocarbon emissions and a suitable hydrogen source on board the vehicle.

by R. F. Stebar; F. B. Parks  
General Motors Res. Labs., Warren, Mich.  
Rept. No. SAE-740187 ; 1974 ; 16p 16refs  
Presented at the Automotive Engineering Congress, Detroit, 25 Feb-1 Mar 1974.  
Availability: SAE

HS-015 279

# **A STUDY OF IGNITION SYSTEM EFFECTS ON POWER, EMISSIONS, LEAN MISFIRE LIMIT, AND EGR TOLERANCE OF A SINGLE-ENGINE--MULTIPLE SPARK VERSUS CONVENTIONAL SINGLE SPARK IGNITION**

The characteristics of multiple spark ignition systems with respect to engine performance, emissions, lean misfire, and tolerance to exhaust gas recirculation (EGR) have been investigated using a carbureted single cylinder engine. The results, which were compared to those obtained with a standard single spark ignition system, show that both lean misfire limit and EGR tolerance are extended with the multiple spark system. The amount of extension varies with engine load, being largest at the lighter loads studied. Engine power and emissions at non-misfiring conditions are the same with both ignition systems.

by J. A. Harrington; R. C. Shishu; J. R. Asik  
Ford Motor Co., Dearborn, Mich.  
Rept. No. SAE-740188 ; 1974 ; 10p 3refs  
Presented at the Automotive Engineering Congress, Detroit, 25 Feb-1 Mar 1974.  
Availability: SAE

HS-801 160

# **ACUTE TOLERANCE TO BEHAVIORAL IMPAIRMENT BY ALCOHOL IN MODERATE AND HEAVY DRINKERS. FINAL REPORT**

Blood alcohol concentration (BAC) estimates were obtained which would be unaffected by differences between arterial and venous BAC levels, techniques were applied to control for practice effects, and rates of alcohol administration were used that were typical of normal drinking patterns. A total of 40 subjects were examined on five behavioral measures at approximately .02% BAC intervals on both the rising and falling BAC curves. Twenty subjects were moderate drinkers tested to a maximum of .10% BAC and 20 were heavy drinkers tested to a maximum of .15%. Greater impairment was found during the rising BAC period than during the falling period. Differences in impairment were equivalent to a change in BAC level of .01-.02%. Performance differences due to past drinking practices (chronic tolerance) were far greater. It is of theoretical significance that the degree of acute tolerance developed by chronic heavy drinkers was as great as or greater than that found for moderate drinkers, suggesting different mechanisms

for acute and chronic tolerance. Forms and questionnaires used in the test are included.

by H. Moskowitz; J. Daily; R. Henderson  
System Devel. Corp., Santa Monica, Calif.  
CONTRACT DOT-HS-009-2-322  
Rept. No. TM(L)-4670/013/00 ; 1974 ; 66p 22refs  
Rept. for 30 Jun 1972-19 Apr 1974.  
Availability: NTIS

HS-801 163

# **AUTOMOTIVE REAR END COLLISION TESTS. FINAL REPORT**

A series of rear end impact tests was conducted to verify the DOT rear end moving barrier test procedure for future rule-making action, to test the adequacy of the procedure to produce repeatable results, and to demonstrate its applicability over a large range of vehicle sizes. The tests also examined the crashworthiness of late model vehicles in rear end collision with regard to occupant protection, head restraints, and fuel tanks. Simulated rear end collisions were also conducted on vehicle front seats, with anthropomorphic dummies, to determine seat reaction. Conclusions were: the rear end moving barrier impact test procedure using a flat-faced barrier was demonstrated to be useful in future compliance testing regarding occupant protection, fuel tanks, and seating standards; the procedure can be used over a wide range of passenger vehicle sizes and weights; the three tests with the same type vehicle and same impact speed indicated a repeatable impact test procedure; in all 30 mph impacts and in one 13.4 mph impact, the front seat deformed until it contacted the knees of the rear dummy or the rear seat; and there was a separation of the filler pipe and fuel tank at the base of the filler pipe on four of the tested vehicles.

by H. Scheuerman; R. Young  
National Aviation Facilities Experimental Center, Atlantic City, N. J.  
CONTRACT DOT-HS-032-1-036; NAFEC-171  
Rept. No. FAA-NA-73-88 ; 1974 ; 265p  
Rept. for Feb-Aug 1973.  
Availability: NTIS

HS-801 174

# **ANTHROPOMORPHIC TEST DUMMY. VOL. 1: PROGRAM SUMMARY--BACKGROUND AND RESULTS. FINAL REPORT**

The design development and performance of an anthropomorphic test dummy is summarized with background and results. The improved features of this contract dummy developed by General Motors for DOT are described including the marked improvement of repeatability and reproducibility the anthropometric and biomechanical basis of the design; improvements of durability, maintainability, ease and cost of manufacture; and improved system and component test procedures, equipment, and test results.

General Motors Corp., Warren, Mich. Engineering Staff  
CONTRACT DOT-HS-299-3-569  
1974 ; 61p 2refs  
Rept. for 1 Dec 1972-21 Dec 1973. Vol. 2 is HS-801 175; vol. 3 is HS-801 176.  
Availability: NTIS

HS-801 175

HSL 75-1

HS-801 175

**ANTHROPOMORPHIC TEST DUMMY. VOL. 2:  
DESIGN, DEVELOPMENT AND PERFORMANCE.  
FINAL REPORT**

The design, development, and testing activities are described in detail for General Motors Corporation's development of an anthropomorphic test dummy. The system tests used to assess the test dummy's repeatability and reproducibility (R & R) are discussed, and the need for rigorous test procedures and equipment for evaluating R & R is identified. Test performance shows that achieved R & R as evaluated by the head and chest SI's have a coefficient of variation of less than five percent. The Contract test dummy's design is detailed including anthropomorphic and biomechanical considerations. Component biomechanical and hardware test procedures, equipment, and test results are presented.

General Motors Corp., Warren, Mich. Engineering Staff  
CONTRACT DOT-HS-299-3-569  
1974 ; 407p 22refs  
Rept. for 1 Dec 1972-21 Dec 1973. Vol. 1 is HS-801 174; vol. 3 is HS-801 176.  
Availability: NTIS

HS-801 176

**ANTHROPOMORPHIC TEST DUMMY. VOL. 3:  
DESIGN DATA PACKAGE. FINAL REPORT**

The information required to use and build the Anthropomorphic Test Dummy developed by General Motors is presented. The user information includes descriptions, weights, ballasting procedures, adjustment information, and assembly instructions. Manufacturing requirements are detailed. Appendices provide a complete parts list and exterior dimensions of the Contract Dummy.

General Motors Corp., Warren, Mich. Engineering Staff  
CONTRACT DOT-HS-299-3-569  
1974 ; 55p  
Rept. for 1 Dec 1972-21 Dec 1973.  
Availability: NTIS

HS-801 178

**HANDBOOK FOR DRIVING KNOWLEDGE TESTING.  
FINAL REPORT**

Materials intended for driving knowledge test development use by operational licensing and education agencies are presented. A pool of 1313 multiple choice test items is included, consisting of sets of specially developed and tested items covering principles of safe driving, legal regulations, and traffic control device knowledge pertinent to passenger car and light truck operation. Statistical and normative data from testing Iowa driver education students, Coast Guard recruits, and Michigan driver license applicants are provided with the items. In addition to a description of the development program that produced the item pool, the report provides recommendations

for use of the item pool and reviews some of the fundamental principles of good test construction practice.

by W. T. Pollock; T. L. McDole  
Michigan Univ., Ann Arbor. Hwy. Safety Res. Inst.  
CONTRACT FH-11-7616  
Rept. No. HSRI-001590-3 ; 1974 ; 392p 1ref  
Rept. for Jul 1970-Sept 1973.  
Availability: NTIS

HS-801 184

**ALCOHOL PUBLIC EDUCATION LITERATURE-  
ALCOHOL COUNTERMEASURES LITERATURE  
REVIEW. FINAL REPORT**

A literature review indicates that if positive results in combating abusive drinking and its ramifications are to be achieved, thinking on the subject of alcohol and human behavior must be revamped, with stereotypes and negative approaches discarded. Effectively communicating the basics of alcohol abuse to the professional and the public remains an urgent identification need. No effective prevention panacea has been found to reduce alcohol abuse. The crux of the issue is coordinating and properly implementing existing laws and provisions to deter further abuse of alcohol in the driving situation. Increased attention is being paid to the problem of alcohol abuse and loss of productivity, but business, industry, government, and the military are far from accepting the fact that it is a problem that can be effectively dealt with by them, and that a sound program is in fact a cost-saving tool of paramount significance. The drinking-driving problem has received much attention, but satisfying results are lacking. The fundamental hurdle to overcome is convincing the American public of the dangers involved in drinking and driving.

by J. D. De Lellis; P. Griffin  
National Safety Council, Chicago, Ill.  
CONTRACT DOT-HS-371-3-786  
1974 ; 15p 38refs  
Report for Jun 1973 - Jun 1974.  
Availability: NTIS

HS-801 202

**A STUDY TO DETERMINE THE CAUSES OF  
ACCIDENTS: AN IN-DEPTH CASE REPORT--CASE  
NO. TAC-SP-73-3, TRACTOR-TRAILER/SCHOOL  
BUS--RIGHT ANGLE (FATAL). FINAL REPORT**

A fatal tractor trailer/school bus accident is described in an in-depth, multidisciplinary report. The principle cause of the accident was the bus driver's failure to maintain a proper lookout crossing a U.S. highway, resulting in failure to observe the oncoming truck. His vision was partially limited by a fogged windshield. Recommendations are offered regarding: school bus driver training programs, defroster performance, heavy truck stopping capabilities, occupant restraints and energy absorbing seat backs for school buses, laminated glass in side and rear windows, improved seat cushion mountings, interior panels, and truck cab crush resistance. Precrash, crash, and postcrash phases for humans and vehicles are described, along with the environmental precrash phase. Appendices include photographs, driver records, police report, film slide index, scene diagram, seating arrangement and injury levels, window frame and glass configuration, bus exterior

and interior deformation schematic, and present and recommended highway configurations.

Indiana Univ., Bloomington. Inst. for Res. in Public Safety  
CONTRACT DOT-HS-034-3-535  
Rept. No. TAC-SP-73-3 ; 1974 ; 90p 2refs  
Availability: NTIS

HS-801 211

## **INSTRUMENTATION METHODOLOGY FOR AUTOMOBILE CRASH TESTING. INTERIM REPORT**

Principal characteristics of existing data acquisition practices and instrumentation methodologies are reviewed to identify differences which are responsible for difficulties in comparing and interpreting structural crash test data. Recommendations are made for standardizing these differences which included non-uniform practices in transducer location, data acquisition and presentation of plotted data. The general nature of current filtering specifications used in structural data acquisition also adversely affects data interpretation and comparison. Examples emphasizing the importance of low frequency data content of occupant compartment accelerometer data are presented and a possible analysis criterion for specifying suitable filtering characteristics for this parameter, is described. A method which has the potential to analytically describe and filter test results by fitting a polynomial curve having limited frequency reproduction capability to digitized crash test data is also proposed. Recommendations for standardized structural data acquisition parameters are made to establish a structural performance base and evaluation criteria for application to full scale production vehicle crash test results. The role of structural crash test data for use in computer simulation model development is also reviewed and its role in current and advanced simulation models is defined based on model input/output characteristics.

by F. P. Di Masi  
Department of Transp., Cambridge, Mass. Transp. Systems Center  
Rept. No. DOT-TSC-NHTSA-74-1 ; 1974 ; 122p 13refs  
Report for Jul 1973 - Jun 1974.  
Availability: NTIS

HS-801 213

## **THE EFFECT OF LOWER LEGAL DRINKING AGE ON YOUTH CRASH INVOLVEMENT. FINAL REPORT**

Several states that recently lowered the legal drinking age to 18 were examined to determine if alcohol-related crashes increased among legally affected populations in three study states, and to determine, if changes occurred, whether a causal relationship exists between the crash experience changes and the legal experimental design. Seven states were studied in a multiple-time-series quasi-experimental design. Through controlled time-series analyses it was found that statistically and socially significant increases in alcohol-related crashes resulted in Michigan and Maine following the lower legal drinking age. A surrogate measure for alcohol-related crash frequencies was used, in that official police data were found to be inadequate for comparative analyses between the seven jurisdictions or over time periods. Analyses of age-specific alcohol-related crash frequency distributions provided support and explanation for the results of the time-series

analyses, and provided a basis for prediction regarding the potential effect of lower legal drinking ages on youth crash involvement. Recommendations for action and research are provided.

by R. L. Douglass; L. D. Filkins; F. A. Clark  
Michigan Univ., Ann Arbor. Hwy. Safety Res. Inst.  
CONTRACT DOT-HS-031-3-754  
Rept. No. UM-HSRI-AL-74-1-2 ; 1974 ; 211p 43refs  
Rept. for 30 Jun 1973-31 Jan 1974.  
Availability: NTIS

HS-801 216

## **EFFECTIVE HIGHWAY SAFETY TRAFFIC OFFENSE ADJUDICATION. VOL. 1: A PERSPECTIVE. FINAL REPORT**

Results of a study designed to identify the more significant developments in traffic offense adjudication are summarized, providing states and local jurisdictions with the information necessary to assist them in the evaluation and improvement of their traffic offense adjudication systems. The study involved a comprehensive survey and analysis of those systems currently being employed in 12 major metropolitan areas. A model traffic offense adjudication process was developed which offers the maximum in highway safety potential and case processing efficiency, while satisfying all essential legal requirements. A brief summary of the findings is presented along with conclusions and recommendations and a description of the model process developed.

Young (Arthur) and Co., Washington, D. C.  
CONTRACT DOT-HS-123-2-442  
1974 ; 25p 2refs  
Report for Jul 1973 - Jun 1974. See also HS-801 217 and HS-801 218.  
Availability: NTIS

HS-801 217

## **EFFECTIVE HIGHWAY SAFETY TRAFFIC OFFENSE ADJUDICATION. VOL. 2: AN ANALYSIS. FINAL REPORT**

A growing concern has been expressed that traffic courts are no longer responsive to the needs of local communities because they are overburdened with case loads too great for their available resources and thus are unable to effectively control drivers who violate traffic laws. Designed to provide an overview of analysis, evaluation, and recommendations concerning effective traffic offense adjudication systems, this volume contains a brief discussion of the role which these systems are expected to play in our society, and of how various changes have been instituted in an effort to improve their performance. Included also is a comprehensive evaluation of the current status of traffic offense adjudication in the United States, based upon the results of extensive legal and field research in 12 representative jurisdictions. A definition and detailed description is given of the adjudication model(s) which have been developed, including a description of the factors which should be considered in implementing the proposed

HS-801 218

model(s). A more definitive description of the methodology employed is included in Volume III of this study, HS-801 218.

Young (Arthur) and Co., Washington, D. C.  
CONTRACT DOT-HS-123-2-442

1974 ; 127p refs

Report for Jul 1973 - Jun 1974. See also HS-801 216 and HS-801 218.

Availability: NTIS

HS-801 218

**EFFECTIVE HIGHWAY SAFETY TRAFFIC OFFENSE  
ADJUDICATION. VOL. 3: REFERENCE VOLUME.  
FINAL REPORT**

Adjudication process profiles employed in 12 urban jurisdictions were examined. Following a definitive description of the approach and methodology employed in the performance of this study of effective highway safety traffic offense adjudication, as well as a further delineation of the information and data developed, conclusion is inescapable that traffic adjudication in the United States needs to be better coordinated between judicial and administrative processes. If there is a shift to administrative adjudication, certain characteristics of judicial proceedings will be retained. If traffic courts continue to adjudicate we can expect even greater innovations in the direction of administrative process. Regardless of whether administrative agencies will be "judicialized" to some degree, or whether courts will function more like administrative agencies, it appears inevitable that traffic adjudication will be handled in a manner which incorporates some of the attributes of both.

Young (Arthur) and Co., Washington, D. C.  
CONTRACT DOT-HS-123-2-442

1974 ; 190p refs

Report for Jul 1973 - Jun 1974. See also HS-801 216 and HS-801 217. Includes ADMINISTRATIVE ADJUDICATION OF TRAFFIC VIOLATIONS CONFRONTS THE DOCTRINE OF SEPARATION OF POWERS, by Robert Force.

Availability: NTIS

HS-801 224

**1974 SAFETY BELT SURVEY. NHTSA/CU  
RESEARCH PROJECT. FINAL REPORT**

A NHTSA/Consumers Union study is described which is part of a program to evaluate the effectiveness of the 1974 safety belt interlock system in increasing belt usage, and to determine owner/driver acceptance of the system. A survey of Consumer Reports readers who own 1974 model cars was conducted to determine detailed information about their reactions to the 1974 interlock and warning system, malfunction/failure of the system, comfort and convenience data, and personal data pertaining to the driver's sex, height, weight, age and education. Results showed that: 95.4% claimed usage of the belts on average distance trips; 31% either defeated or circumvented the interlock system over 50% of the time; malfunction or failure was reported by 36.5%, although only 7.4% reported a problem that had to be repaired by a mechanic; of the people who wear the belt system, 90% wear the combination lap and shoulder belt correctly; two most common suggestions for im-

HSL 75-1

provement were for easier fastening and change in shoulder belt placement to avoid its cutting across the neck.

by R. L. Hix, Jr.; P. N. Ziegler  
National Hwy. Traf. Safety Administration, Washington, D. C.; McDonnell Douglas Automation Co., Falls Church, Va.  
1974 ; 53p

Rept. for Sep 1973-Jul 1974. Prepared in cooperation with Consumers Union.

Availability: NTIS

HS-801 228

**PEDESTRIAN MODEL PARAMETRIC STUDIES.  
VOL. 1: SUMMARY. INTERIM REPORT**

by K. Gagnon; R. N. Karnes; J. L. Tocher  
Boeing Computer Services, Inc., Seattle, Wash.  
CONTRACT DOT-HS-356-3-719

Rept. No. BCS-G0554-1 ; 1974 ; 16p

Rept. for Jul 1973-Jun 1974. For abstract and search terms see Vol. 2, HS-801 229.

Availability: NTIS

HS-801 229

**PEDESTRIAN MODEL PARAMETRIC STUDIES.  
VOL. 2: VEHICLE DESIGN OPTIMIZATION  
PROGRAM. INTERIM REPORT**

A study for determining optimal vehicle designs and for performing a sensitivity analysis of these designs is described. The vehicle design is to be optimal in that the designs minimize pedestrian fatalities in computer simulated pedestrian/vehicle impacts. Sensitivity analyses will be conducted to determine the changes in pedestrian injuries resulting from changes in the optimal design. The techniques are described which have been developed for optimization and sensitivity analysis, and the computer program which will be used for the study is presented. Details are given on design variables, accident conditions, and population and pedestrian injury indexes. Statistical modeling is included.

by K. Gagnon; R. N. Karnes; J. L. Tocher  
Boeing Computer Services, Inc., Seattle, Wash.  
CONTRACT DOT-HS-356-3-719

1974 ; 89p 54refs

Vol. 1 (summary) is HS-801 228.

Availability: NTIS

HS-801 239

**THE EFFECTS OF AUTOMOBILE INTERIOR  
DESIGN CHANGES ON INJURY RISK. FINAL  
REPORT**

The changes in injury source rankings associated with the introduction of the major safety oriented component modifications (pre- vs. post-standards vehicles) were examined along with the influence of the energy absorbing (EA) steering assembly on occupant injury risk and the influence of the head restraint on whiplash injury risk. Data pertaining to one and two car collisions involving American make automobiles manufactured between 1960 and 1973 were used. Regarding injury source rankings, little change between pre- and post-standards vehicles was recorded for injuries classified as minor, but for serious injury, decreases in injury hazard associated

ie instrument panel, windshield, and steering assembly vident. For overall injury, the EA system was demon- effective in reducing injury risk for lap belted drivers, latively ineffective for unrestrained drivers, except in peed accident situations. Results for individual injury vere similar for both unrestrained and lap belted drivers. tive influence (decrease in injury risk) on the incidence d injury and no influence on thorax injury risk were ed. No reduction in the risk of whiplash injury asd with the head restraint safety device was demon- , but this finding must be considered tentative due to ng inadequacies.

3. Anderson  
n Corp., Buffalo, N. Y.  
RACT DOT-HS-053-3-619; Ref: DOT-HS-053-2-277  
Jo. ZQ-5276-V-5 ; 1974 ; 41p 12refs  
or Jan-Dec 1973.  
oility: NTIS

270

# PUTERIZED TRAFFIC RECORDS SYSTEM.

## CITY OF OXNARD. FINAL REPORT. EXECUTIVE SUMMARY

The detailed design, development, and implementation of a computerized traffic records system for Oxnard, California, is described. The system is oriented toward providing manage- ment information reports for traffic enforcement and traffic engineering. It produced scheduled reports and special request reports for special studies. It also contains features which uti- lize information not previously available on a formal or timely basis, including: identification of hazardous locations, before and after studies, improved use of selective enforcement, and selective data retrieval capability.

City of Oxnard, Calif.  
1974 ; 17p  
Sponsored by the Office of Traf. Safety, State of Calif., and the National Hwy. Traf. Safety Administration.  
Availability: City of Oxnard, Oxnard Traffic Records, P.O.Box 1192, Oxnard, Calif. 93030



## **CONTRACTS AWARDED**

## NHTSA CONTRACTS AWARDED

### **DOT-HS-024-1-115 Mod. 5** **MULTIDISCIPLINARY ACCIDENT INVESTIGATION**

Southwest Research Institute  
5500 Culebra Road  
San Antonio, Texas 78228  
To be completed 31 Oct 75  
\$299,149.00

Evaluation of both passive and active restraint systems on 1973-75 model year vehicles is to be made. In-depth vehicle data and medical injury records on fatal and injury cases of Guadalupe, Comal, Hayes and Travis counties will be added to statistics of Bexar County, Texas. To evaluate the effectiveness of the Air Cushion Restraint Systems (ACRS) to be introduced as options in the 1974-75 vehicles, NHTSA has selected five regional ACRS accident teams to perform the data acquisition and investigative aspects of this project in addition to the Texas counties. Objectives are to estimate the injury reducing effects of the ACRS; determine the operational characteristics of ACRS and to evaluate public/owner acceptance of the ACRS. End result is to be a comprehensive report entitled "Multidisciplinary Accident Investigations—Special Study of Active and Passive Restraint Systems in 1974-75 Model Year Vehicles." This report will include introductory material, discussion of overall results, effectiveness of the restraint systems standards, conclusions and recommendations.

### **DOT-HS-032-1-036 Mod. 14** **LATERAL COLLISION TEST PROGRAM**

U.S. Department of Transportation  
Federal Aviation Agency  
Experimental Center  
Atlantic City, N.J.

Extended to 30 Sept 74  
Increased \$55,853.95

The program is extended to include six (6) additional lateral collision tests using the Contoured Moving Barrier, to fabricate a device to measure force on vehicle sheet metal, and to perform measurements on ten (10) vehicles.

### **DOT-HS-185-3-599IA Mod. 3** **PHOTOMETRIC TESTING OF VEHICLE GLAZING SURFACES**

National Bureau of Standards  
Washington, D.C. 20234  
Extended to 30 Jun 74  
\$7,000.00

Heat load tests on two identical 4-door sedans will be run in the Phoenix, Arizona, area during February or March 1974. Static tests shall be made with the vehicles positioned at various angles with respect to the incident sun rays. Dynamic tests shall be made at speeds up to 50 mph over routes chosen to provide data at different angles of incident sun rays. Both static and dynamic head load tests shall be conducted in direct sunlight on warm days. Data acquired will be analyzed and compared with previous theoretical calculations by the Contractor on heat load.

### **DOT-HS-350-3-707 Mod. 1**

#### **ALCOHOL SAFETY ACTION PROGRAM LEVEL II GROUP DYNAMICS MODEL**

McBer and Company  
675 Massachusetts Avenue  
Cambridge, Mass. 02139

Extended to 1 Sept 74

\$69,941.00

This modification provides for expansion of the program to train up to 20 persons in Power Motivation Training Techniques and to train up to 12 Power Motivation Training Instructors per each of five ASAP sites. Further objectives are to develop community understanding and support of the program and to integrate it with other rehabilitation services. Evaluation research designs will be implemented at each site so that the effectiveness of the program can be measured, with specific reference to its impact on drinking and driving problems.

### **DOT-HS-354-3-716 Mod. 2**

#### **PILOT DIAGNOSTIC INSPECTION DEMONSTRATION PROJECT**

District of Columbia  
Department of Motor Vehicles  
301 C Street, N.W.  
Washington, D.C. 20590

Extended to 30 Jun 75

\$538,000.00

The Department of Motor Vehicles, District of Columbia, will have the responsibility of concluding the PA part of the Motor Vehicle Inspection Evaluation Project. An additional 740 vehicles are to be inspected in four cities. A prototype modification of the mobile inspection facility, Van 2, will be updated

and the feasibility of including computerized application will be determined. An engine analysis activity that must interface with the computerized portion of the diagnostic system now under contract to AVCO will be included in the fixed diagnostic inspection lane. Data accumulated in brake studies will be analyzed. Factor relationships that might eliminate the necessity of pulling wheels for inspection are to be studied. Diagnostic inspection lane activities must be explained to the industry and data being procured in the various engineering evaluation studies must be analyzed for certain relationships. The on-line computer system in the pilot model diagnostic lane will be modified to integrate exhaust emission inspection inputs and engine analysis information, and the feasibility of including an electronic headlamp testing as part of the computerized diagnostic inspection system will be explored.

#### **DOT-HS-357-3-721 IA Mod. 1**

##### **EXPLORATORY ANALYSIS OF STATE DATA TAPES FOR PEDESTRIAN AND BICYCLIST ACCIDENT INFORMATION**

Mr. E. L. Bittle  
L. G. Hanscom Field  
Bedford, Maine 01730

Extended to 9 Oct 74

\$29,541.00

NHTSA is examining the feasibility of developing a Pedestrian/Bicyclist Accident Data Sampling and Analysis Program (PADSAP). To determine to what degree the current lack of information covering pedestrian and bicycle accidents is due to the fact that necessary data are not collected, and to what degree it results from the fact that presently collected data are not sufficiently processed, the information already available in State accident data bases as part of the PADSAP survey design has been examined. Objective of this modification is to determine if useful information can be obtained from existing tapes. Exploratory analysis of tapes of two given States will be made to determine the degree of detail of data elements pertaining to bicycle and pedestrian factors, the availability and completeness of information and the expected number of pedestrian and bicycle accidents recorded. Conclusions and recommendations will be made as to use of overall results in pedestrian and bicycle safety program planning, and as to the advisability and utility of extending such exploratory analyses to other State data bases.

#### **DOT-HS-370-3-780 Mod. 2**

##### **CHILD TEST DUMMY EVALUATION**

Transportation Research Center of Ohio  
East Liberty, Ohio 43319

Extended to 15 Aug 74

Increased \$13,908.00

Determination of bending characteristics in flexion and extension of the neck and lumbar spine test data will be obtained on static and dynamic performance and repeatability of two 3-year-old child test dummies under the conditions of static loads, drop tests, and simulated 30 mph frontal impact environment of three typical child restraint systems. Determination of deflection characteristics of the chest will also be made. Pendulum impact tests will measure the dummies head characteristics and sled test runs will be made.

#### **DOT-HS-4-00802 Mod. 2**

##### **SAFETY HELMET PERFORMANCE EVALUATION**

Southwest Research Institute  
8500 Culebra Road  
San Antonio, Texas 78284

Extended through 1 Jul 74

\$3,650.00

Tests will be conducted to compare impact attenuation results with homogenous helmet samples, using both the Southwest Research impact apparatus and the conventional drop assembly manufactured by the Grant Division of Royal Industries.

#### **DOT-HS-4-00865 Mod. 1**

##### **FABRICATION OF A STANDARD BENCH VEHICLE SEAT**

University of Michigan  
Highway Safety Research Institute  
260 Research Administrative Bldg.  
Ann Arbor, Mich. 48105

Extended to 31 Aug 74

\$9,035.00

Using the standard vehicle seat simulator of full bench configuration, various 1974 vehicle belt systems will be tested with child restraint systems and dummy occupants. Objective is to verify whether or not belt release occurs with inertia or other type locking mechanisms in belt reels.

**DOT-HS-4-00866 Mod. 1**

**VEHICLE ROLLOVER TESTING**

Department of Transportation  
Federal Aviation Administration  
Atlantic City, New Jersey 08405

To be completed by 31 Mar 75

\$19,054.64

NAFEC will perform rollover tests on three modified vehicles. This will be in addition to the requirements of the basic Agreement to perform rollover tests on three baseline vehicles.

**DOT-HS-4-00871 Mod. 2**

**OPERATION AND MAINTENANCE OF THE COMBINED OSE PERIODIC REPORTS SYSTEM AND TIRE TEST DATA MANAGEMENT SYSTEM**

Control Systems Research, Inc.  
1515 Wilson Boulevard  
Arlington, Va. 22209

No change

\$12,936.00

Modification provides for the combined operation of the Tire Test and OSE Reporting System and the addition of the capability to the integrated OSE Reporting System to monitor and control the "Matrix Tire Line" for FMVSS-109 and the "Manufacturer Product Line" for FMVSS-17.

**DOT-HS-4-00876**

**COMMENT CONTRACT SYSTEM**

Control Systems Research, Inc.  
1515 Wilson Boulevard  
Arlington, Va. 22209

To be completed by 30 Oct 74

\$23,500.00

Continuing ADP support to Traffic Safety Programs for the Comment Control System for the revised highway safety program standards will be provided by the Contractor who will code comments from meetings, conferences and additional documents; modify the standard version numbers so that each comment is associated with the version to which it pertains; generate periodic reports; formulate queries for special data studies into the appropriate machine readable code and run the retrievals; and add comments about bicycle safety made to revised Standard 14 which is required by PL 93-87, Section 231.

**DOT-HS-4-00890**

**PROTOTYPE NATIONAL ACCIDENT INVESTIGATION STRATEGY AND EVALUATION OF G.M. AIR CUSHION RESTRAINT SYSTEM**

Regents of the University of Michigan  
260 Research Administrative Boulevard  
Ann Arbor, Michigan 48105

To be completed two years from date of contract award

\$258,620.00

The Contractor shall perform a tri-level accident investigation pilot program for development and pilot testing, in a geographically defined area, of a methodology whereby specified collision data can be obtained which are statistically representative of traffic accident rates and trends on a nationwide basis. A second objective is to develop a methodology for obtaining control data for those instances where a special study's experimental design requires information from a non-accident population or an accident control group population. The Contractor will further collect data to evaluate the effectiveness of the Air Cushion Restraint System (ACRS) to be introduced as optional equipment in 1974 and 1975 luxury class General Motors vehicles. Objectives here will be to estimate the injury reducing effects of the ACRS, determine the operational characteristics of it and evaluate public/owner acceptance of the ACRS. School bus accidents in Region III in which three or more occupants receive fatal injuries will also be investigated.

**DOT-HS-4-00897**

**IMPACT OF RECENT CHANGE IN HIGHWAY SAFETY ENVIRONMENT**

University of North Carolina  
Highway Safety Research Center  
Chapel Hill, North Carolina 27514

To be completed three years from date of contract award

\$70,000

Major changes in highway safety operational environment within the last few years include new safety belt systems, a 50 mph speed limit and an acceleration of the shift from large to small cars. The National Highway Traffic Safety Administration has a need to measure and to analyze the effects of these changes and to understand their implications for future policy and research decisions. To produce current estimates of safety belt usage rates and injury reduction effects, the Contractor will investigate factors on vehicle, make, model, body style, and year; occupant personal

characteristics; crash force and direction; crash configuration; occupant seated position; highway type and traffic conditions; time; trip purpose; sobriety of driver and occupants; and driver violations. The Contractor will produce one or more reports on analysis, interpretation, conclusions and recommendations for action, policy and further research on the effect of 1972 and later model years belt systems upon belt usage and accident injuries; variations in usage and injury reduction effects; the error or bias in the data collected, and methods to reduce or eliminate their effects. Extensions and modifications of previously developed measures for measuring and comparing vehicle crashworthiness will be investigated to provide measures of crashworthiness and of accident involvement characteristics.

**DOT-HS-4-00898**

**MULTIDISCIPLINARY ACCIDENT INVESTIGATION DATA FILE**

Regents of the University of Michigan  
260 Research Administration Boulevard  
Ann Arbor, Michigan 48105

To be completed 30 Dec 74

\$97,650.00

The Contractor shall, in consultation with NHTSA, continue automation of MDAI reports; improve the case quality; document editing criteria and reference information; develop an accident causation coding scheme; enhance data file utilization; technical consultation and systems design; provide capability for transferral of data base at government's option; build special files to permit a closer exchange of information between bi-level and MDAI program special files; and develop and implement new variables as specified. Effective usage of the files developed by this effort requires computer access and capability, provided by a separate contract.

**DOT-HS-4-00900**

**HANDLING TEST PROCEDURES FOR PASSENGER CARS AND LIGHT TRUCKS PULLING TRAILERS**

Systems Technology, Inc.  
13766 S. Hawthorne Blvd.  
Hawthorne, Calif. 90250

To be completed 31 Jul 75

\$253,761.00

Contractor shall develop, validate, and document a set of performance tests suitable for making appraisals and evaluations of passenger car and light trucks dynamic performance when pulling trailers under

realistic highway driving maneuvers. A set of meaningful objective vehicle response parameters which can be used to assess and quantify the safety performance of passenger cars and light trucks pulling trailers with respect to their handling properties exhibited during accident avoidance maneuvers will be identified, defined and ranked according to relative importance. Based on these vehicle response parameters, and appropriate set of objective test procedures for evaluating passenger cars and light truck dynamic performance when pulling trailers will be developed. These test procedures must be applicable to both types of vehicles in various ways and a test plan for such handling test procedures will be developed.

**DOT-HS-4-00903**

**DEVELOPMENT AND APPLICATION OF VEHICLES RATING CRITERIA FOR DAMAGE SUSCEPTIBILITY, CRASHWORTHINESS AND REPAIRABILITY**

General Electric Company  
Information Systems Programs  
1400 Wilson Boulevard, Suite 1100  
Arlington, Va. 22209

To be completed 18 months from date of contract award

\$866,270.00

The Contractor shall prepare and implement individual Vehicle Rating Criteria Systems using data and information from varied sources, including: crash data and accident crash data; limited component, subassembly and assembly tests; insurance loss data; engineering design crash test data; results from mathematical modeling and simulation, etc. The study shall cover 1973 and 1974 model year actual and predicted results and predict results for 1975 model year vehicles.

**DOT-HS-4-00904**

**STUDY OF AUTOMOBILE BUYING BEHAVIOR METHODS FOR DISSEMINATING COMPARATIVE VEHICLE INFORMATION AND INTEGRATION OF TITLE II ACTIVITIES**

Booz, Allen and Hamilton, Inc.  
Booz Allen Applied Research  
4733 Bethesda Avenue  
Bethesda, Md. 20014

To be completed by 30 May 76

\$568,957.00

Based on the findings of existing studies of consumer buying behavior and data generated, the Contractor will consider alternatives, conduct trade-off studies,

and recommend the most appropriate forms and procedures for Title II of the Motor Vehicle Information and Cost Savings Act of 1972 information dissemination; conduct a vehicle owner survey; and assist in integration of all Title II activities. This will involve a survey and review of pertinent consumer behavior literature; a study of consumer buying factors; evaluation and recommendation of alternative dissemination methods; recommended plan(s) for presenting insurance cost comparisons and preparation of the rule establishing procedures requiring automobile dealers to distribute the cost comparisons of insurance for different makes and models of passenger cars based upon differences in damage susceptibility and crashworthiness. A final report will include evaluation of findings and research conclusions.

**DOT-HS-4-00905**

**TIRE TREADWEAR TEST**

South Texas Tires Test Fleet  
P.O. Drawer J  
Devine, Texas 78238

To be completed 13 weeks from date of contract award

\$31,973.00

In order to develop a standard treadwear course and data base for establishing treadwear standards for use in a Uniform Tire Quality Grading (UTQG) system for tires, tests will be conducted on a treadwear course located at Goodfellow Air Force Base, San Angelo, Texas. After 400 mile testing, the tires from three identical vehicles will be measured for tread depth by a hand gauge and by an automatic tire tread depth measuring and recording device. A second group of tires from twelve identical vehicles will be run a total of 6,400 miles with rotations made after each 400 miles and then tested for tread depth. The purpose of the UTQG system is to provide the consumer with information relative to the performance of tires which will make it possible for him to make an informed choice at the time of purchase.

**DOT-HS-4-00906**

**PERFORMANCE EVALUATION OF INTERNATIONAL 50th PERCENTILE COMPLIANCE TEST DUMMIES**

Transportation Research Center of Ohio  
East Liberty, Ohio 43319

To be completed ten months from date of contract award

\$165,450.00

Two sets of test dummies, each set consisting of two identical 50th-percentile human males, and which have been designed and built to meet the specifications of Part 572, Anthropomorphic Test Dummy, will be submitted to acceleration-type test sled performance. These dummies have been acquired by the National Highway Traffic Safety Administration (NHTSA) through an international cooperations program. Testing is to establish the degree of conformance of the new test dummies with the specifications of Part 572, and the ranges of dynamic performance and repeatability of test dummies in representative crash environments.

**DOT-HS-4-00907**

**MOTORCYCLE HEADLIGHTING RESEARCH**

Regents of the University of Michigan  
260 Research Administration Building  
Ann Arbor, Michigan 48105

To be completed 12 months from date of contract award

\$75,095.00

Headlamps for three classes of motorcycles will be evaluated—those that are not capable of attaining speeds over 25 mph; those having a maximum speed of about 40 mph; and those that encompass all the larger motorcycles. Dependent variables of interest are target detection distance and precision of vehicle control. Independent variables other than headlamp type are straight versus curved roads, target type, motorcycle speed, and presence of an opposing glare vehicle.

**DOT-HS-4-00908**

**TIRE TESTING FOR UNIFORM QUALITY GRADING SYSTEM**

Department of the Air Force  
HQ 6940th Air Group (USAFSS)  
Goodfellow Air Force Base, Texas 76901

To be completed 5 Aug 74

\$165,000.00

An area of existing macadam pavement will be made into a skid surface by the application of Portland cement concrete, equilibrium surface texture. A second area of pavement will be covered with hot-mixed asphalt concrete with crushed silicious gravel aggregate to provide a skid surface. Ramps will be built as approaches to these areas and access roads built to link them. The entire system will be utilized for tire testing.

**DOT-HS-4-00909**

**CONSUMER INFORMATION CRASH TEST PROGRAM**

Ultrasystems, Inc.  
Dynamic Science Division  
1850 West Pinnacle Peak Road  
Phoenix, Ariz. 85027

To be completed 16 months from date of contract award

\$336,280.00

Tests are to be conducted for the automobile crash test portion of the Automobile Consumer Information Study (Title II, Motor Vehicle Information and Cost Savings Act). Late model vehicles and anthropomorphic test dummies will be used in fixed barrier collision, moving barrier collision, and car-to-car crash tests conducted to validate the vehicle rating systems for damage susceptibility, crashworthiness, and ease of diagnosis and repair now being developed.

**DOT-HS-4-00910**

**CONSUMER INFORMATION CRASH TEST PROGRAM**

Calspan Corporation  
P.O. Box 235  
Buffalo, New York 14221

To be completed 16 months from date of contract award

\$300,819.00

Tests are to be conducted for the automobile crash test portion of the Automobile Consumer Information Study (Title II, Motor Vehicle Information and Cost Savings Act). Late model vehicles and anthropomorphic test dummies will be used in fixed barrier collision, moving barrier collision, and car-to-car crash tests conducted to validate the vehicle rating systems for damage susceptibility; crashworthiness, and ease of diagnosis and repair now being developed.

**DOT-HS-4-00911**

**MINICOMPUTER AND INTERACTIVE GRAPHICS**

Vector General, Inc.  
8399 Topanga Canyon Boulevard  
Canoga Park, Calif. 91304

To be completed six months from date of contract award

\$169,850.00

A minicomputer and graphic display unit to assist the National Highway Traffic Safety Administration (NHTSA) in exercising and developing computer simulation programs will be developed. Contractor is to provide systems hardware and software maintenance and training course for use of the system.

**DOT-HS-4-00912**

**VEHICLE BRAKE FLUID: WATER TOLERANCE AND VISCOSITY**

Automotive Research Associates, Inc.  
5404 Bandera Road  
San Antonio, Texas 78238

To be completed 30 months from date of contract award

\$84,735.00

To gather data on the in-service water pick-up by conventional and low water tolerant brake fluids when used in conventional braking systems, and the effects on the system and its performance, a fleet operation will be used. Also to be determined are the effects of these fluids and the water pick-up on the brake system components and the performance of the system. A fleet of at least 39 vehicles will be operated over a two-year period in a hot, humid area such as Florida or the Gulf Coast. Brake fluid in each vehicle will be sampled from the master cylinder and wheel cylinders at specified intervals.

**DOT-HS-4-00913**

**COLLISION AVOIDANCE RADAR BRAKING SYSTEM INVESTIGATIONS**

The Bendix Corporation  
Research Laboratories  
20800 Ten and One-Half Mile Road  
Southfield, Oakland, Mich. 48076

To be completed 3 months from date of contract award

\$24,638.00

The primary objectives of Phase I of this research effort are to conduct a systematic state-of-the-art investigation of vehicular anticipatory braking systems, proposed designs, system requirements, and related literature; to establish the basic system definition and alternatives in specific areas to the extent of problem identification and to establish a weighted priority list containing all the defined system elements. Upon definition of the system, operation, and performance elements, a priority assignment of importance and need for further study shall be determined with justification for each. For the set of unresolved elements, this critical ranking at the completion of Phase I shall define the approach sequence to be following during Phase II and other future efforts.

**DOT-HS-4-00915**

**ODI DATA MANAGEMENT SYSTEM**

General Research Corporation  
7655 Old Springhouse Road  
McLean, Virginia 22101

To be completed 28 May 75

\$83,588.00

The Contractor shall update, maintain and modify the Office of Defects Investigation (ODI). Data Management Systems data base file. Services for special data studies will be provided as requested by ODI.

**DOT-HS-4-00916**

**INCREASE CAPACITY OF INERTIA DYNAMOMETER**

Greening Associates, Inc.  
19465 Mt. Elliot Avenue  
Detroit, Mich. 48234

To be completed by 17 Jun 75

\$80,590.00

A proposal will be made detailing the technical approach to be taken to provide the necessary hardware and installation services to increase the capabilities of an existing dual-end hydraulic brake inertia dynamometer, or to provide a new brake application servo control panel. This panel will serve in conjunction with the existing pressure/torque potentiometers to provide a selection of five independent brake input pressure levels and ten independent brake output torque levels while controlling the test brake(s) under certain testing conditions.

**DOT-HS-4-00918**

**INVESTIGATION OF ELECTROMAGNETIC INTERFERENCE EFFECTS ON MOTOR VEHICLE ELECTRONIC CONTROL AND SAFETY DEVICES**

Department of Commerce  
Institute for Telecommunications Sciences  
Boulder, Colo. 80302

To be completed eight months after date of contract award

\$100,000.00

This research effort is to investigate, identify, test, analyze, and resolve the potential problem of electromagnetic interference (EMI) from all sources internal or external to the vehicle that may cause malfunction of motor vehicle electronic control and electronically actuated safety critical devices. Specific vehicle systems to be investigated will be air bag systems, anti-lock braking systems, radar braking systems, electronic

fuel injection and electronic ignition. The Contractor will develop performance requirements and design installation guidelines for use by the industry in constructing EMI restraint vehicle subsystems.

**DOT-HS-4-00919**

**FATALITY FILE ANALYSIS**

Safety Management Institute  
7979 Old Georgetown Road  
Suite 500  
Bethesda, Md. 20014

To be completed six months after date of contract

\$31,329.00

The Fatality Analysis File (FAF) will be made more amenable to processing with the Statistical Package for the Social Sciences (SPSS). The Contractor will design subfiles of the FAF to be used with the SPSS statistical package, perform an exploratory analysis of the data completeness and quality, and produce an extensive series of bivariate tabulations that show the distributions of fatal accidents State-by-State and for the entire United States.

**DOT-HS-4-00920**

**TIRE TREADWEAR VALIDATION**

Hodges Transportation Inc.  
Nevada Automotive Test Center  
P.O. Box 234  
Carson City, Nev. 98701

To be completed 12 months from date of contract award

\$77,779.00

The Contractor will develop a test vehicle with the appropriate controls and instrumentation which will be used to validate a cost-effective and objective treadwear test technique. Contractor will design and fabricate this test vehicle of sufficient versatility to provide a universal and objective treadwear measuring test technique, performing pilot tests to determine and evaluate performance and reliability. Two groups of two tires each will be used to compare system, tire and performance levels. The tires will be tested on two identical automobiles to establish a customer rating of tires. The validated test technique will be utilized for measuring and grading treadwear life under the Uniform Tire Quality Grading System (UTQGS). The developed test methodology and generated data will be analyzed for possible contribution and use for treadwear measurement of tires.

**DOT-HS-4-00921****QUANTIFICATION OF THORACIC RESPONSE AND INJURY**

The Regents of the University of Michigan  
260 Research Administration Boulevard  
Ann Arbor, Mich. 48105

To be completed 24 months from date of contract award

\$240,010.00

A test plan will be developed to review and examine efforts to characterize the thoracic response and/or related injuries to a living human or surrogate to impact. Unembalmed cadavers and live animal testing will be considered to determine the necessary and sufficient kinematic instrumentation on the thorax so that it will be sensitive to load, area and direction of loading, chest deflection, and other parameters considered to be predictive of thoracic response and injuries. A test matrix to adequately characterize the kinematic and kinetic response with resulting injury to the thorax will be devised and tested with these also. From data derived, sufficient performance specifications will be produced and evaluated so that when a surrogate chest is designed to and actually does comply with these specifications it will be kinematically equivalent to the thorax of a human being.

**DOT-HS-4-00922****OCCUPANT SURVIVABILITY IN LATERAL AND ROLLOVER COLLISIONS**

Calspan Corporation  
4455 Genesee Street  
Buffalo, N.Y. 14221

To be completed 30 Aug 75

\$226,995.00

The purpose of this study is to investigate the feasibility of modifications to the vehicle interior and glazing which, when combined with structural modifications to upgrade compartment integrity, will allow occupants to survive severe accidents in these modes in a completely passive manner. Rollover and side impact tests will be analyzed to learn more about occupant and vehicle kinematics to gain a better understanding of how occupants are injured in these accident modes. Based on this analysis, the Contractor will prepare appropriate conclusions and recommendations relative to improved side impact and rollover protection.

**DOT-HS-4-00923****TIRE PARAMETER DETERMINATION**

Calspan Corporation  
4455 Genesee Street  
Buffalo, N.Y. 14221

To be completed 30 Jun 75

\$243,370.00

The objective of this research effort is to develop a body of tire parameter data including correlation factors between dynamic laboratory and actual on-road measured tire parameters. This effort shall encompass all sizes and types of tires covered by FMVSS 109 and 119 to assure greater flexibility in the vehicle handling simulation. Techniques for rapid determination of performance data and computer translation factors resulting from advances in tire state-of-the-art will be considered, and a compendium of all test data will be submitted as part of the final report.

**DOT-HS-4-00924****FIELD DEMONSTRATION OF POLARIZED LIGHTING**

Southwest Research Institute  
8500 Culebra Road  
San Antonio, Texas 78284

To be completed 30 Apr 75

\$19,844.00

The Contractor will communicate with members of the Organization for Economic Cooperation and Development (OECD) Committee on Polarized Lighting Research regarding location for a field demonstration on polarized lighting. An "on the road" presentation of polarized lighting will be given to officials of member nations of OECD and officials of the Department of Transportation to demonstrate the full impact of its effectiveness. A questionnaire designed to obtain the reactions of the group to the polarized lighting system, will be prepared and presented to them.

**DOT-HS-4-00925****EVALUATION OF GLARE REDUCTION TECHNIQUES**

Brown Engineering Company, Inc.  
Cummings Research Park  
Huntsville, Ala. 35807

To be completed 20 Jun 75

\$84,480.00

The Contractor will refine developed means of specifying maximum glare levels allowable in a vehicle without significant visual performance degradation,

modify an existing instrument which measures glare in a vehicle and determine the levels of glare in current model passenger vehicles, trucks and buses. The necessary design changes of several specific vehicles which would reduce the level of glare and demonstrate by vehicle modification and glare measurements the validity of these glare reducing techniques will be investigated. The present reflector will be modified or replaced with a reflector of other quality. Using this modified hardware, the Contractor will measure vehicles to determine actual luminance of glare caused by light reflected from the top of the instrument panel, via the windshield, into a measuring photometer, and the luminance, angular size, and angular off the line of sight of glare in the forward field of view. Vehicles will be measured for glare using previously developed techniques and the modified glare instruments.

**DOT-HS-4-00926**

**UNIFORM TIRE QUALITY GRADING—TRACTION VALIDATION PROGRAM**

Transportation Research of Ohio  
East Liberty, Ohio 43319

To be completed 16 Aug 74

\$39,492.00

The Contractor will supply a force type trailer and sufficient manpower to perform traction tests on a population of 100 passenger car tires for a period of 42 working days. The testing will take place at ITT, College Station, Texas, and at Goodfellow AFB, San Angelo, Texas. The Contract Technical Manager (CTM) will be supplied with raw data from the measurement system as each tire is tested on the specified surfaces. Data will be reduced by the CTM.

**DOT-HS-4-00927**

**SOLID-STATE DIGITAL DATA RECORDER FOR MONITORING ANTHROPOMORPHIC DUMMY IMPACT ENVIRONMENTS**

Raman Sciences Corporation  
1500 Garden of the Gods Road  
Colorado Springs, Colo. 80907

To be completed 12 months from the date of contract award

\$88,085.00

One nine channel digital recording system using large scale integrated circuitry will be designed, made, and

delivered. The system will be designed to record the data from the Federal Motor Vehicle Safety Standard #208. The complete system, eight sensors, batteries and recorder shall be totally within the Standard Part 572, fiftieth percentile Anthropomorphic Dummy. The configuration and dummy alteration will be such that the dummy characteristics of weight, center of gravity, moment of inertia, and strength, will be similar before and after the system installation. Packaging will be in three channel units consistent with the tri-axial accelerometer sensors. One unit shall be in the head of the dummy and two of the three channel units shall be in the pelvic area. The Federal Aviation Administration Medical Institute at Oklahoma City is the test facility for this system.

**DOT-HS-4-00928**

**TRAFFIC LAWS ANNOTATED; DRIVER LICENSING LAWS ANNOTATED; TRAFFIC LAWS COMMENTARIES AND COMMITTEE WORKBOOKS**

National Committee on Uniform Traffic Laws and Ordinances

1776 Massachusetts Avenue, N.W.

Suite 430

Washington, D.C. 20036

To be completed 31 May 75

\$70,000.00

The Contractor will prepare and deliver to the National Highway Traffic Safety Administration (NHTSA) a second annual supplement to Traffic Laws Annotated (TLA) published in 1972. Annotations of State traffic laws as of December 31, 1974, will be included, as compared with the latest edition of the Uniform Vehicle Code (UVC). The first annual supplement to Driver Licensing Laws Annotated shall be prepared and include annotations of State driver licensing laws as of December 31, 1973, as compared to UVC. Traffic Law Commentaries containing analysis and comparison of State traffic laws on Rules of the Road and Accident Investigation and Reporting Laws, State pedestrian safety laws and bicycle safety laws, and traffic ordinances, relating to pedestrian and bicycles adopted by 50 cities or communities will be submitted to NHTSA, together with the Agenda to be used by the National Committee on Uniform Traffic Laws and Ordinances in plenary session in 1975 to consider revisions in UVC and Model Traffic Ordinances.

**DOT-HS-4-00948**

**PARTS RETURN PROGRAM**

General Environments Corporation  
6840 Industrial Road  
Springfield, Va. 22151

To be completed one year from date of contract award  
\$156,772.00

Collection of failed parts from independent automotive repair shops will be made. Material is to include brake, steering and suspension components which have failed during normal operation. Following careful examination of each part received, the Contractor will provide NHTSA with failed parts data to be stored in a computer retrieval system. When failure patterns appear in two or more parts of the same design and by the same manufacturer, particulars will be submitted to NHTSA immediately.

**DOT-HS-4-00953**

**PILOT PROGRAM OF CURRICULUM: EMERGENCY MEDICAL SERVICE**

Dunlap & Associates, Inc.  
One Parkland Drive  
Darien, Conn. 06820

To be completed 31 Dec 75

\$64,828.00

The Contractor shall initiate a study to match a model curriculum and materials, which are to be provided, with educational institutions which, to some extent, are operating with comparable curricula and materials. Three modifications of the curricula will be involved for which the Contractor will identify and describe a model or example institution or training agency, including college catalog, course description, prerequisites, etc., and for each of which a minimum list of five prospective participating institutions, showing preliminary interest and intention to participate in the program, will be compiled. An agreement with one each of the three types of participating institutions, which will include periodic written reports of progress, evaluations, and on-site monitoring, will then be reached in order that the three curriculum models may be field tested.

